

4. Verification.

4.1. Methods of Verification.

The methods of verification and qualification used to verify the requirements of Section 3 of this specification and Appendices A, and D through J are defined as follows.

- a. Examination. Inspection consisting of investigation without the use of special laboratory appliances or procedures, or supplies and services to determine conformance to the specified requirements which can be determined by such investigations. Examination is generally nondestructive and includes visual, auditory, olfactory, tactile, and other investigations; simple physical manipulation; gauging; and measurements.
- b. Analysis. Review of applicable documentation or test results. Verification shall be by established mathematical or technical models or simulations, algorithms, charts, graphs, circuit diagrams, or other scientific principles and procedures to provide evidence that stated requirements were met.
- c. Demonstration. Actual operation, adjustment, or re-configuration of items to provide evidence that the designed functions were accomplished. Components may be instrumented and quantitative limits of performance monitored.
- d. Test. Verification and inspection shall generally denote the determination, by technical means, of the properties or elements of items, including functional operation, and involves the application of established scientific principles and procedures.
- e. Certification. A document asserting that the item complies with the applicable requirements. Certifications must include documented test results, performance data, analytical data or vendor documentation. The certifications must be made available to the Government representatives immediately upon request for review during inspections.

4.2 Classification of inspections.

The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3).
- b. Quality conformance inspections (see 4.4)

4.3 First article inspection.

When a First Article (FA) inspection is required it shall be performed on one of each fixed site and mobile system component (see 6.2). FA units shall be examined and tested in accordance with the qualification inspections designated as FA of table V and table VI, VII, VIII, IX, X, XI, XII, XIII, or XIV as applicable to the particular unit under test. Presence of one or more defects shall be cause for rejection of a unit.

4.4 Quality conformance inspections.

4.4.1 Group A inspection and test.

Each individual unit as defined by the contract (see 6.2) shall be inspected in accordance with the qualification inspections designated as GA of table III and table IV, V, VI, VII, VIII, IX, X, XI, or XII as applicable to the particular unit under test. Failure of a component to pass these tests

shall be cause for rejection.

4.4.2 Group B tests.

A system level performance test shall be performed on each fixed site and mobile set system configuration prior to formal system acceptance. This system verification shall be performed in accordance with the qualification inspections designated as GB of table III and tables IV, V, VI, VII, VIII, IX, X, XI, or XII as applicable to the particular configuration of units under test.

TABLE III. Qualification Inspection

INSPECTION	REQUIREMENTS PARAGRAPH	TEST PARAGRAPH	Classification of Inspection	
System configuration	3.1	4.5.27	FA	
<u>Software</u>	<u>3.1.1</u>	<u>4.5.23</u>	<u> </u>	<u>GB</u>
Hardware	3.1.2	4.5.27	FA	
System design	3.2	4.5.23, Table (III-XI)	FA	GB
CCTT system performance	3.2.1	4.5.23, Table (III-XI)	GB	
System latency	3.2.2.1 - 3.2.2.2	4.5.24	FA	
Dead reckoning algorithms	3.2.3	4.5.25	FA	
Design modularity	3.2.4	4.5.26	FA	
Weight	3.2.4.1	4.13	FA	
Ceiling height	3.2.4.2	4.14	FA	
Equipment dimensions	3.2.4.3	4.15	FA	
Trainer maintenance access	3.2.4.4	4.16	FA	
Power requirements	3.2.4.5-3.2.4.5.4 3.8.5-3.8.5.3	4.17	FA	
Equipment cooling	3.2.4.6	4.18	FA	
Console Lighting	3.2.4.7	4.19	FA	
Cabling	3.2.4.9	4.20	GA	<u>GB</u>
Color	3.2.4.8	4.11.1	FA	
Availability	3.2.5	4.9	 GB <u>FA</u>	
Maintainability	3.2.6	4.10	FA	
Built-in test	3.2.6.2.1-3.2.6.2.1.3	4.7	FA GB <u>A</u>	
Environmental	3.2.7-3.2.7.4	4.6	FA	
Transportability	3.2.7.5	4.20	FA	

Recycled, recovered, or environmentally preferable mat.	3.3.1	4.11	FA	
Safety	3.3.3 - 3.3.3.4	4.8	FA GBA	
Human Factors Engineering	3.3.4	4.8.1	FA	
<u>Module Common performance requirements</u>	<u>3.6-3.6.7</u>	<u>See TABLES IV-X</u>	<u>See TABLES IV-X</u>	
OC	3.7.1	4.5.1	GA	GB
ALOC	3.7.1.1	4.5.2		GB
TOC	3.7.1.2	4.5.3		GB
CES	3.7.1.2.1	4.5.3.1		GB
FSE	3.7.1.2.2	4.5.4		GB
UMCP	3.7.1.3	4.5.5		GB
FDC	3.7.1.4	4.5.6		GB
FABTOC	3.7.1.5	4.5.7		GB
TACP	3.7.1.6	4.5.8		GB
Higher Headquarters Workstation	3.7.1.7	4.5.9		GB
Control consoles	3.7.2	4.5.10		GB
MCC	3.7.2.1	4.5.10 (a - e)		GB
Start-up procedures	3.7.2.1.1	4.5.10, 4.8.10.1		GB
Exercise control	3.7.2.1.2	4.5.10 (a - e)		GB
Exercise initialization	3.7.2.1.2.1	4.5.10 (a - e)		GB
Exercise modification	3.7.2.1.2.2	4.5.10 (a - e)	FA GB	
Exercise real-time intervention	3.7.2.1.2.3	4.5.10 (a - e)	GB F	
Current status	3.7.2.1.3	4.5.10 (a - e)		GB
MCC console printer	3.7.2.1.4	4.5.10j		GB
AAR	3.7.2.2-3.7.2.2.8	4.5.10(f-i)		GB
<u>Maintenance console</u>	<u>3.7.2.3</u>	<u>4.5.11.1(d)</u>	<u>FA</u>	
Trainer system processing	3.7.3	4.5.11	GB F	
Trainer system h/w resource	3.7.3.1	4.5.11.1(a)	GB F	
System composition	3.7.3.1.1	4.5.11.1(b)	GB F	

Processor requirements	3.7.3.1.2	4.5.11.1(c)	GBFA	
Peripherals	3.7.3.1.3	4.5.11.1(e)		GB
Spare requirements	3.7.3.1.4	4.5.11.1(f)	FA	
LAN	3.7.4 - 3.7.4.5, 3.2.5	4.5.12	FA	GB
Visual System	3.7.5 and (App. A)	4.5.13 - 4.5.13.7.2.1	See TABLE XII	
Communication System	3.7.6 - 3.7.6.3.1	4.5.14	GA	GB
SAF	3.7.7 and (App. D)	4.5.15 - 4.5.15.1.4	GA	GB

TABLE IV. Qualification Inspection M1A1 module

INSPECTION	REQUIREMENTS PARAGRAPH	TEST PARAGRAPH	CLASSIFICATION OF INSPECTION		
M1A1 Module	F.3.1	4.5.16	GA		
Performance Characteristics	F.3.1.1	4.5.16	GB		
Visual Display System	F.3.1.1.1	4.5.16.3	See TABLE XII		
Fire Control System	F.3.1.1.2	4.5.16	GB		
Weapons and Ammunition	F.3.1.1.3	4.5.16	GB		
Electrical System	F.3.1.1.4.1	4.5.16	GB		
Hydraulic System	F.3.1.1.4.2	4.5.16	GB		
Depletable Resource Management	F.3.1.1.5	4.5.16	GB		
Damage and Failure	F.3.1.1.6	4.5.16	GB		
Sound Generation System	F.3.1.1.7 - F.3.1.1.7.7	4.5.16.1	FA	GA	GB
Communication System	F.3.1.1.8	4.5.16.2	GB		
Physical Characteristics	F.3.1.2	4.5.16.4	FA		
Controls and Indicators	F.3.1.2.1 - F.3.1.2.2.6	4.5.16.4.1	FA	GA	
External Interface Unit	F.3.1.2.3	4.5.16.5	GB		

TABLE V. Qualification Inspection M2A2/M3A2 module

INSPECTION	REQUIREMENTS PARAGRAPH	TEST PARAGRAPH	CLASSIFICATION OF INSPECTION
M2A2/M3A2 Module	G.3.1	4.5.17	GB
Performance Characteristics	G.3.1.1	4.5.17	GB

Visual Display System	G.3.1.1.1	4.5.17.3	See TABLE XII
Fire Control System	G.3.1.1.2	4.5.17	GB
Weapons and Ammunition	G.3.1.1.3	4.5.17	GB
Electrical System	G.3.1.1.4.1	4.5.17	GB
Hydraulic System	G.3.1.1.4.2	4.5.17	GB
Depletable Resource Management	G.3.1.1.5	4.5.17	GB
Damage and Failure	G.3.1.1.6	4.5.17	GB
Sound Generation System	G.3.1.1.7- G.3.1.1.7.7	4.5.17.1	FA GA GB
Communication System	G.3.1.1.8	4.5.17.2	GB
Physical Characteristics	G.3.1.2	4.5.17.4	FA
Controls and Indicators	G.3.1.2.1- G.3.1.2.1.6	4.5.17.4.1	FA GA
External Interface Unit	G.3.1.2.2	4.5.17.5	GB

TABLE VI. Qualification Inspection DI module

INSPECTION	REQUIREMENTS PARAGRAPH	TEST PARAGRAPH	CLASSIFICATION OF INSPECTION
Dismounted Infantry Module	3.7.10	4.5.18	GB
Physical characteristics	3.7.10.1 - 3.7.10.1.2	4.5.18.1	FA <u>GA</u>
Performance characteristics	3.7.10.2	4.5.19.2	GB
Weapons	3.7.10.2.1	4.8.18.2(a)	GB
Movement	3.7.10.2.2	4.5.18.2(b)	GB
Fire control system	3.7.10.2.3	4.5.18.2(c)	GB
Depletable resource management	3.7.10.2.4	4.5.18.2(d)	GB
Controls and indicators	3.7.10.3-3.7.10.3.2	4.5.18.3	GB
Visual display system	3.7.10.4	4.5.18.4	See TABLE XII
Communication system	3.7.10.5-3.7.10.5.1	4.5.18.5	GB
Sound generation system	3.7.10.6-3.7.10.6.7	4.5.18.6	FA GA GB

TABLE VII. Qualification Inspection FIST-V module

INSPECTION	REQUIREMENTS PARAGRAPH	TEST PARAGRAPH	CLASSIFICATION OF INSPECTION
FIST-V Module	I.3.1	4.5.19	GA GB

Performance Characteristics	I.3.1.1	4.5.19	GB
Visual Display System	I.3.1.1.1	4.5.19.3	See TABLE XII
Vehicle Weapons System	I.3.1.1.2	4.5.19	GB
Weapons and Ammunition	I.3.1.1.3	4.5.19	GB
Electrical System	I.3.1.1.4.1	4.5.19	GB
Hydraulic System	I.3.1.1.4.2	4.5.19	GB
Depletable Resource Management	I.3.1.1.5	4.5.19	GB
Damage and Failure	I.3.1.1.6	4.5.19	GB
Sound Generation System	I.3.1.1.7 - I.3.1.1.7.7	4.5.19.1	FA GA GB
Communication System	I.3.1.1.8	4.5.19.2	GB
Physical Characteristics	I.3.1.2	4.5.19.4	FA
Controls and indicators	I.3.1.2.1 - I.3.1.2.6	4.5.19.4.1	FA GA
External Interface Unit	I.3.1.2.7	4.5.19.5	GB

TABLE VIII. Qualification Inspection M1A2 module

INSPECTION	REQUIREMENTS PARAGRAPH	TEST PARAGRAPH	CLASSIFICATION OF INSPECTIONS
M1A2 Module	H.3.1	*4.8.20	GA GB
Performance characteristics	H.3.1.1	4.5.20	GB
GB	H.3.1.1.1	4.5.20.3	See TABLE XII
Fire Control System	H.3.1.1.2	4.5.20	GB
Weapons and Ammunition	H.3.1.1.3	4.5.20	GB
Electrical system	H.3.1.1.4.1	4.5.20	GB
Hydraulic system	H.3.1.1.4.2	4.5.20	GB
Depletable Resource Management	H.3.1.1.5	4.5.20	GB
Damage and Failure	H.3.1.1.6	4.5.20	GB
Sound Generation System	H.3.1.1.7	4.5.20.1	FA GA GB
Communication System	H.3.1.1.8	4.5.20.2	GB
Physical characteristics	H.3.1.2	4.5.20.4	FA
M1A2 Controls/Indicators	H.3.1.2.1 - H.3.1.2.2.6	4.5.20.4.1	FA GA
External Interface Unit	H.3.1.2.3	4.5.20.5	GB

TABLE IX. Qualification Inspection M113A3 APC module

INSPECTION	REQUIREMENTS PARAGRAPH	TEST PARAGRAPH	CLASSIFICATION OF INSPECTIONS
M113A3 APC Module	E.3.1	4.5.21	GA GB
Performance Characteristics	E.3.1.1	4.5.21	GB
Visual Display System	E.3.1.1.1	4.5.21.3	See TABLE XII
Vehicle weapons system	E.3.1.1.2	4.5.21	GB
Weapons and ammunition	E.3.1.1.3	4.5.21	GB
Support Systems	E.3.1.1.4	4.5.21	GB
Depletable Resource Management	E.3.1.1.5	4.5.21	GB
Damage and Failures	E.3.1.1.6	4.5.21	GB
Sound Generation System	E.3.1.1.7 - E.3.1.1.7.7	4.5.21.1	FA GA GB
Communication System	E.3.1.1.8	4.5.21.2	GB
Physical Characteristics	E.3.1.2	4.5.21.4	FA
Controls and Indicators	E.3.1.2.1 - E.3.1.2.2	4.5.21.4.1	FA GA
External Interface Unit	E.3.1.2.3	4.5.21.5	GB

TABLE X. Qualification Inspection HMMWV module

INSPECTION	REQUIREMENTS PARAGRAPH	TEST PARAGRAPH	CLASSIFICATION OF INSPECTIONS
HMMWV Module	J.3.1	4.5.22	GA GB
Performance Characteristics	J.3.1.1	4.5.22	GB
Visual Display System	J.3.1.1.1	4.5.22.3	See TABLE XII
Vehicle Weapons System	J.3.1.1.2	4.5.22	GB
Weapons and ammunition	J.3.1.1.3	4.5.22	GB
Electrical Systems	J.3.1.1.4.1	4.5.22	GB
Depletable Resource Management	J.3.1.1.5	4.5.22	GB
Damage and Failure	J.3.1.1.6	4.5.22	GB
Sound Generation System	J.3.1.1.7 - J.3.1.1.7.7	4.5.22.1	FA GA GB
Communication System	J.3.1.1.8	4.5.22.2	GB
Physical Characteristics	J.3.1.2	4.5.22.4	FA

Controls and Indicators	J.3.1.2.1 - J.3.1.2.1.3	4.5.22.4.1	FA GA
External Interface Unit	J.3.1.2.2	4.5.22.5	GB

TABLE XI. Qualification Inspection mobile configuration

INSPECTION	REQUIREMENTS PARAGRAPH	TEST PARAGRAPH	CLASSIFICATION OF INSPECTIONS
Mobile CCTT requirements	3.8-3.8.1	4.12	GB
Workstations	3.8.1	4.12	GB
Environmental conditions	3.8.2-3.8.2.2- 3.8.3	4.12.1	FA
Lightning protection	3.8.2.3	4.12.1.1	FA
Shock and vibration	3.8.3	4.12.1.2	FA
Semitrailers	3.8.4	4.12.2	FA
Identification, marking, and data plates	3.8.4.1	4.12.2.1	GA
Color	3.8.4.2	4.12.2.2	FA
Corrosion prevention	3.8.4.3	4.12.2.3	FA
Wood	3.8.4.4	4.12.2.4	FA
Wood treatment	3.8.4.5	4.12.2.5	FA
Weights, loads, dimensions	3.8.4.6-3.8.4.6.3	4.12.2.6-4.12.2.6.3	FA GA
Dimensions	3.8.4.6.4-3.8.4.6.4.2	4.12.2.6.4	FA
Performance	3.8.4.7-3.8.4.7.4	4.12.2.7	FA GA
Brake performance	3.8.4.7.3,3.8.4.12.1- 3.8.4.12.2	4.12.2.7.1	GA
Slope and grade	3.8.4.7.4	4.12.2.7.2	FA
Suspension system	3.8.4.8	4.12.2.8	GA
Axles	3.8.4.9	4.12.2.9	GA
Wheels, rims, tires, and tubes	3.8.4.10-3.8.4.10.2	4.12.2.10	FA
Rear wheel splash and stone throw protection	3.8.4.11	4.12.2.11	FA
Brakes	3.8.4.12-3.8.4.12.2	4.12.2.12	GA
Upper fifth wheel plate	3.8.4.13	4.12.2.13	GA
Landing gear and leveling	3.8.4.14	4.12.2.14	GA
Level indicators	3.8.4.15	4.12.2.15	FA — GA
Lifting and tiedown attach.	3.8.4.16	4.12.2.16	FA GA

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Rear end protection	3.8.4.17	4.12.2.17	GA
Lubrication	3.8.4.18	4.12.2.18	FA
Body construction	3.8.4.19-3.8.4.19.6	4.12.2.19	FA GA
Side wall and roof framing	3.8.4.19.2	4.12.2.19.1	FA
Front end	3.8.4.19.4	4.12.2.19.2	FA
External doors/rear doors	3.8.4.19.5	4.12.2.19.3	FA
Other external doors	3.8.4.19.5.2	4.12.2.19.4	FA
Thermal protection	3.8.4.19.6	4.12.2.19.4	FA
Interior construction	3.8.4.20-3.8.4.20.4	4.12.2.20	FA
Semitrailer lighting	3.8.4.21.- 3.8.4.21.1.4	4.12.2.21	GA
12VDC system	3.8.4.21.1.1	4.12.2.21.1	GA
Receptacle, 12VDC	3.8.4.21.1.2	4.12.2.21.2	GA
Interconnected 24VDC	3.8.4.21.1.3	4.12.2.21.3	GA
Receptacle, 24VDC	3.8.4.21.1.4	4.12.2.21.4	GA
Interior lighting	3.8.4.21.2-3.8.4.21.2.2	4.12.2.21.5	GA
Exterior lighting	3.8.4.21.3	4.12.2.21.6	GA
Battery charging system	3.8.4.21.4	4.12.2.21.7	GA
External platforms, railings	3.8.4.22	4.12.2.22	GA
Environmental Control system	3.8.4.23	4.12.2.23	FA
Cooling units	3.8.4.23.1	4.12.2.23.1	FA
Heating	3.8.4.23.2	4.12.2.23.2	FA
Control circuits	3.8.4.23.3	4.12.2.23.3	FA
Air filters	3.8.4.23.4	4.12.2.23.4	FA
Maintainability	3.8.4.23.5	4.12.2.23.5	FA
Humidity control	3.8.4.24	4.12.2.24	FA
Fire extinguishers	3.8.4.25	4.12.2.25	GA
Alarm system	3.8.4.26-3.8.4.26.2.3	4.12.2.26	GA
Telephone system	3.8.4.27	4.12.2.27	GA
Furniture and chairs	3.8.4.28	4.12.2.28	GA
Provisions for maintenance	3.8.4.29	4.12.2.29	GA
Provisions for storage	3.8.4.30	4.12.2.30	GA
Electrical system	3.8.4.31-3.8.4.32	4.12.2.31	FA
External panels and cables	3.8.4.32	4.12.2.32	FA

Usable life of trailer	3.8.4.33	4.12.2.33	FA	
Portable Power System	3.8.5-3.8.5.3	4.12.3	<u>FA</u>	GA

TABLE XII. Qualification Inspection for visual appendix A

INSPECTION	REQUIREMENTS PARAGRAPH	TEST PARAGRAPH	CLASSIFICATION OF INSPECTIONS	
Visual system	3.7.5, Appendix A	4.5.13	Not Applicable	
Mechanical interface	A.3.1.1.1	4.5.13.1	FA	
Electronic interface	A.3.1.1.2	4.5.13.2	<u>FA</u>	GB
Software interface	A.3.1.1.3	4.5.13.3	<u>FA</u>	GB
Major components	A.3.1.2 – A.3.1.2.4	4.5.13.4	FA	
Performance	A.3.2.1	4.5.13.5	GB	
General training scene	A.3.2.1.1	4.5.13.5.1	GB	
Range of vision	A.3.2.1.1.1	4.5.13.5.1.1	<u>FA</u>	GB
Vehicle simulation	A.3.2.1.1.2	4.5.13.5.1.2	GB	
Ground missile combat	A.3.2.1.1.3	4.5.13.5.1.3	GB	
Ground mounted combat	A.3.2.1.1.4	4.5.13.5.1.4	GB	
Ground dismounted combat	A.3.2.1.1.5	4.5.13.5.1.5	GB	
Ground-to-air combat	A.3.2.1.1.6	4.5.13.5.1.6	GB	
Special real-time processing	A.3.2.1.2	4.5.13.6	Not Applicable	
Atmospheric and meteorological effects	A.3.2.1.2.1	4.5.13.6.1	Not Applicable	
Ambient visibility (haze)	A.3.2.1.2.1	4.5.13.6.1.1	FA	GB
Fog simulation	A.3.2.1.2.1	4.5.13.6.1.2	FA	GB
Cloud simulation	A.3.2.1.2.1	4.5.13.6.1.3	FA	GB
Rain simulation	A.3.2.1.2.1	4.5.13.6.1.4	<u>FA</u>	GB
Sky and horizon	A.3.2.1.2.1	4.5.13.6.1.5	<u>FA</u>	GB
Illumination	A.3.2.1.2.2	4.5.13.6.2	FA	
Time of day	A.3.2.1.2.2.1	4.5.13.6.3	FA	
Artificial illumination	A.3.2.1.2.2.2	4.5.13.6.4	Not Applicable	
Flare illumination	A.3.2.1.2.2.2.1	4.5.13.6.4.1	<u>FA</u>	GB
Light points	A.3.2.1.2.2.2.2	4.5.13.6.4.2	FA	
Light point and intensity control	A.3.2.1.2.2.2.3	4.5.13.6.4.3	FA	
Tactical smoke	A.3.2.1.2.3	4.5.13.6.5	<u>FA</u>	GB

Own-vehicle dynamics	A.3.2.1.2.4.1	4.5.13.6.6	GB	
Moving/repositioning/switchable models	A.3.2.1.2.4.2	4.5.13.6.7	FA	GB
Animation and special effects	A.3.2.1.2.4.3	4.5.13.6.8	Not Applicable	
Propeller/rotor disc.	A.3.2.1.2.4.3.1	4.5.13.6.8.1	<u>FA</u>	GB
Visible weapons effect	A.3.2.1.2.4.3.2	4.5.13.6.8.2	<u>FA</u>	GB
Air-to-ground weapons effects	A.3.2.1.2.4.3.2.1	4.5.13.6.8.3	<u>FA</u>	GB
Weapons fire and weapons impact effect	A.3.2.1.2.4.3.2.2	4.5.13.6.8.4	<u>FA</u>	GB
Tracer simulation	A.3.2.1.2.4.3.2.2.1	4.5.13.6.8.5	<u>FA</u>	GB
Dust trail	A.3.2.1.2.4.3.3	4.5.13.6.8.6	<u>FA</u>	GB
Simulated position	A.3.2.1.2.5.1	4.5.13.6.8.7	FA	
Laser range finder	A.3.2.1.2.5.2	4.5.13.6.8.8	FA	GB
Gaming area	A.3.2.1.2.5.3	4.5.13.6.8.9	FA	GB
Image quality, general	A.3.2.1.3	4.5.13.6.9	Not Applicable	
Visual image sharpness	A.3.2.1.3.2	4.5.13.6.9.1	FA	
Surface resolution	A.3.2.1.3.2	4.5.13.6.9.2	FA	
Light point resolution	A.3.2.1.3.2	4.5.13.6.9.3	FA	
Luminance	A.3.2.1.3.3	4.5.13.6.9.4	FA	
Luminance variation	A.3.2.1.3.3.1	4.5.13.6.9.5	FA	
Contrast	A.3.2.1.3.4	4.5.13.6.9.6	FA	
Color	A.3.2.1.3.5	4.5.13.6.9.7	FA	
Color processing	A.3.2.1.3.5.1	4.5.13.6.9.7.1	FA	
Image perspective and geometric accuracy	A.3.2.1.3.6	4.5.13.6.9.8	FA	
Total geometric accuracy	A.3.2.1.3.6.1	4.5.13.6.9.8.1	FA	
Relative geometric errors	A.3.2.1.3.6.2	4.5.13.6.9.8.2	FA	
Vernier resolution	A.3.2.1.3.7	4.5.13.6.9.9	FA	
Adjacent channel matching	A.3.2.1.3.8	4.5.13.6.9.10	FA	
Image stability	A.3.2.1.3.9	4.5.13.6.9.11	FA	
Video rate	A.3.2.1.3.10	4.5.13.6.9.12	FA	
Update rate	A.3.2.1.3.11	4.5.13.6.9.13	FA	
Transport delay	A.3.2.1.3.12	4.5.13.6.9.14	FA	
Occulting	A.3.2.1.3.13	4.5.13.6.9.15	FA	
Smear	A.3.2.1.3.14	4.5.13.6.9.16	FA	

Flicker	A.3.2.1.3.15	4.5.13.6.9.17	FA	
Stepping	A.3.2.1.3.16	4.5.13.6.9.18	FA	
Image quality (system capacity)	A.3.2.1.4	4.5.13.6.10	Not Applicable	
Continuous image density	A.3.2.1.4.1	4.5.13.6.10.1	<u>FA</u>	GB
Feature selection	A.3.2.1.4.1.1	4.5.13.6.10.1.1	FA	GB
Scene content management	A.3.2.1.4.2	4.5.13.6.10.2	FA	GB
Scene management mechanism	A.3.2.1.4.2.1	4.5.13.6.10.2.1	FA	GB
Environment integrity	A.3.2.1.4.2.2	4.5.13.6.10.2.2	FA	GB
Scene management dynamics	A.3.2.1.4.2.3	4.5.13.6.10.2.3	FA	GB
Overload prevention	A.3.2.1.4.2.4	4.5.13.6.10.2.4	FA	GB
Display configurations	A.3.2.1.5	4.5.13.6.11	FA	GB
Full circle vision block config.	A.3.2.1.5.1	4.5.13.6.11.1	FA	GB
Popped hatch displays	A.3.2.1.5.2	4.5.13.6.11.2	FA	GB
Driver displays	A.3.2.1.5.3	4.5.13.6.11.3	FA	GB
Loader displays	A.3.2.1.5.4	4.5.13.6.11.4	<u>FA</u>	GB
Sights	A.3.2.1.5.5	4.5.13.6.11.5	FA	GB
Module/console specific	A.3.2.1.6	4.5.13.6.12	FA	
M1A1/M1A2 tank module	A.3.2.1.6.1	4.5.13.6.12.1	FA	
M2A2 tank module	A.3.2.1.6.2	4.5.13.6.12.2	FA	
M981 fire support team vehicle	A.3.2.1.6.3	4.5.13.6.12.3	FA	
M113A3 tank module	A.3.2.1.6.4	4.5.13.6.12.4	FA	
HMMWV tank module	A.3.2.1.6.5	4.5.13.6.12.5	FA	
DI module	A.3.2.1.6.6	4.5.13.6.12.6	FA	
AAR visual display	A.3.2.1.6.7	4.5.13.6.12.7	FA	
AAR debrief display	A.3.2.1.6.8	4.5.13.6.12.8	FA	
TACP visual display	A.3.2.1.6.9	4.5.13.6.12.9	FA	
Electro-optics sensor image	A.3.2.1.7	4.5.13.6.12.10	<u>FA</u>	GB
Sensor image database	A.3.2.1.7.1	4.5.13.6.12.10.1	FA	GB
Thermal sight image simulation	A.3.2.1.7.3	4.5.13.6.12.10.2	FA	GB
Night vision image intensifier	A.3.2.1.7.4	4.5.13.6.12.10.3	FA	GB
Laser range finder	A.3.2.1.7.5	4.5.13.6.12.10.4	<u>FA</u>	GB
Major components characteristics	A.3.3	4.5.13.7	Not Applicable	
Image generator subsystem	A.3.3.1	4.5.13.7.1	FA	GB
IG system throughput	A.3.3.1.1	4.5.13.7.1.1	FA	<u>GB</u>

Displayed image artifacts	A.3.3.1.2	4.5.13.7.1.2	FA	GB
Anti-aliasing	A.3.3.1.2.1	4.5.13.7.1.2.1	FA	GB
Special image generator processing	A.3.3.1.3	4.5.13.7.1.3	FA	GB
Texture	A.3.3.1.4	4.5.13.7.1.4	FA	GB
Mapping	A.3.3.1.4.1	4.5.13.7.1.4.1	FA	GB
Anti-aliasing and blending	A.3.3.1.4.2	4.5.13.7.1.4.2	FA	GB
Dynamic texture	A.3.3.1.4.3	4.5.13.7.1.4.3	FA	GB
Database storage capacity	A.3.3.1.5	4.5.13.7.1.5	FA	GB
Improved IG performance	A.3.3.1.6	4.5.13.7.1.6	FA	GB
Image display subsystem	A.3.3.2	4.5.13.7.2	FA	GB
Optics	A.3.3.2.1	4.5.13.7.2.1	FA	
Magnified displays	A.3.3.2.2	4.5.13.7.2.3	FA	GB

4.5 Test methods.

Tests shall be performed as stated herein. These tests are the minimum required to determine and assure conformance to each requirement of Sections 3 and 5. The qualification or verification inspection methods as defined in paragraph 4.1.1 shall be used to ensure compliance as required herein.

4.5.1 Operations Center (OC)

The requirements of paragraph 3.7.1 shall be verified by examination and demonstration via execution of a system exercise (see 6.2).

4.5.2 Administrative Logistics Center (ALOC).

The requirements of paragraph 3.7.1.1 shall be verified by demonstration.. The demonstration shall be performed by conducting a training exercise (see 6.2) which allows the observation of how resources of ammunition and fuel are controlled from the CSS console. The ability of the operator at the CSS console to dispatch M978 HEMTT trucks for fuel and M977 HEMTT trucks for ammunition to support the vehicles shall be demonstrated. The dispatched trucks shall be visible when traveling to the requested locations. The CSS console shall display the current status of support vehicles showing what supplies and amount are available. The training exercise shall also demonstrate that the supply trucks are vulnerable to combat damage, and susceptible to breakdowns.

4.5.3 Tactical operations center.

The ability of the TOC to meet the requirements as specified in paragraph 3.7.1.2 shall be verified through demonstration via the execution of a system exercise (see 6.2)..

4.5.3.1 Combat engineering support

It shall be verified by demonstration, via system exercise execution (see 6.2), that the CES console (3.7.1.2.1) provides to the operator the capabilities of emplacement minefields and obstacles and their destruction in real time, and that the movement on the current terrain data

base is affected by the emplacement and destruction. Demonstrate that the CES console provides the capability to breach minefields and obstacles using dismounted infantry and the other equipment as specified in 3.7.1.2.1, and that the CES console provides control and movement of the M728 Combat Engineering Vehicle (CEV) and M9 Armored Combat ~~Earthmover~~
~~Vehicle~~ (ACE).

4.5.4 Fire support element.

It shall be verified, by demonstration, via execution of a system exercise (see 6.2) that the FSE console provides the capabilities stated in 3.7.1.2.2.

4.5.5 Unit Maintenance Collection Point.

The requirements of paragraph 3.7.1.3 (UMCP) shall be verified by demonstration. The demonstration shall be performed by conducting a training exercise (as in 4.5.2) that will allow the observation of how the repair and recovery of all combat vehicles is coordinated from this console.. The ability of the operator at the UMCP console to dispatch M1083 MTV series 5 Ton trucks to support the requesting combat vehicles shall be demonstrated. The dispatched trucks ~~/vehicles~~ shall be visible when traveling to the requesting locations.

4.5.6 Fire Direction Center (FDC).

The FDC requirements of paragraph 3.7.1.4 shall be verified by ~~analysis and~~ demonstration. The requirements shall be demonstrated by conducting a training exercise (see 6.2) that will allow the observation of how the firing of the vehicles and mortars is computed and controlled from the FDC console.

4.5.7 Field Artillery Battalion TOC.

The requirements of paragraph 3.7.1.5 shall be verified by examination and demonstration. It shall be demonstrated that the FABTOC consoles provide FDC personnel with the capabilities as specified in paragraph 3.7.1.5 (a through h) by conducting an exercise (see 6.2) .

4.5.8 Tactical Air Control Party (TACP).

The requirements of paragraph 3.7.1.6 shall be verified by analysis and demonstration.. The requirement shall be demonstrated by conducting a training exercise (see 6.2) that will allow the observation of how the types of close air support missions involving fixed wing aircraft, and the capabilities and displays as specified, are controlled from the TACP console.

4.5.9 Higher headquarters workstation.

The requirements of paragraph 3.7.1.7 shall be verified by examination and demonstration. The workstation shall be examined to verify that it consists of three SINCGARS radio sets, a work surface, and a chair as specified. A training exercise (see 6.2) shall be conducted to demonstrate that command and control, communications, and support communications are provided to the TOC.

4.5.10 Master Control Console (MCC) and After Action Review Console (AAR).

The requirements of paragraphs 3.7.2 through 3.7.2.2.8 shall be verified by examination and demonstration. The examination shall consist of verifying that the MCC and AAR are provided with the capabilities and equipment as specified. A training exercise shall be conducted to

demonstrate the functionality of the MCC and AAR consoles as specified in paragraphs 3.7.2.1 through 3.7.2.2.8 and the following:

- a. Demonstrate that the MCC console is provided with a security system that will prohibit unauthorized use, and show its capabilities.
- b. Demonstrate that the MCC console is provided with a menu system that will allow for initialization of the CCTT system, perform BIT, provide status reporting of the CCTT system, and lead the operator to other functions as required.
- c. Demonstrate that the console provides the operator the capability to develop, change, and select training exercises for use in CCTT. The capability to generate a new exercise, or copy and develop a derivative of an already existing exercise shall also be provided.
- d. Demonstrate that the console has the capability to modify existing exercises, that provides the operator the capability to monitor and change any and all parameters of an exercise during real-time mode, and that the stored data file for that exercise is not affected.
- e. Demonstrate that at all times the console provides to the operator the status of all equipment, modules, and supplies used in CCTT configuration.
- f. Demonstrate that the AAR display console is comprised of a high resolution monitor with the characteristics and capabilities specified, and that the capabilities can be accomplished during real-time operation of the training exercises.
- g. Demonstrate that the AAR console can store and replay complete training scenarios with the additional capabilities of paragraph 3.7.2.2.4.
- h. Demonstrate that the AAR console is provided with the capability of automatic data collection as specified in paragraph 3.7.2.2.6 and that after completion of a training exercise, the performance data is provided in hard copy format and in a statistical format. The data collected shall include the details as specified in paragraph 3.7.2.2.6 and shall be recorded, displayed and printed as requested from the AAR console through the use of menus.
- i. Demonstrate that the AAR console provides the capabilities of recording all radio communication traffic for the selected exercise. The console shall be examined to verify that it consists of at least four loudspeakers with capabilities as specified.
- j. Verify that the MCC and MC stations provide the capabilities specified in paragraph 3.7.2.1.4.

4.5.10.1 Initialization

The requirements for initialization of the CCTT system (3.7.2.1.2.1) shall be demonstrated via a training exercise (see 6.2) as follows: The controlling operator shall initialize the CCTT system from the MCC console and shall input all data necessary for starting a training session. It shall be demonstrated throughout the training session that when a module finishes the required start-up procedures (including BIT), a message is displayed at the MCC console indicating that the individual module is up and ready for the exercise. The identification of individual modules on the LAN shall be demonstrated by introducing the individual module "identifiers" into the CCTT system during the start-up procedures for a particular exercise

4.5.11 Trainer System Processing Resource (TSPR).

The TSPR shall be examined to verify that it is comprised of one group of trainer system processing resources to perform the workstation and console functions, and another group of trainer system processing resources for the simulation modules specified in paragraph 3.7.3.

4.5.11.1 Trainer System Hardware Resource (TSHR).

The ~~T~~trainer ~~S~~system ~~H~~hardware ~~R~~resources shall be verified as follows:

- a. Verify by certifications that the requirements of paragraph 3.7.3.1 has been met.
- b. Verify by examinations that the requirements of paragraph 3.7.3.1.1 has been met.
- c. Processor requirements. It shall be verified through analysis that each processor meets the system performance requirements (3.7.3.1.2) herein and that all displays are free of stepping, oscillating, jittering, or other erratic behavior.
- d. Verify by examination the physical characteristics and demonstrate via system scenario execution (see 6.2) the required capabilities of the maintenance console as required by paragraph 3.7.2.3.
- e. Verify by certification and examination that the peripheral equipment provided with the computer system meets the requirements as specified in paragraph 3.7.3.1.3.

4.5.11.1.1 Spare requirements

The system's spare requirements as specified in paragraph 3.7.3.1.4.a through 3.7.3.1.4.d shall be tested as follows:

- a. Processor spare memory, paragraph 3.7.1.3.4.a, testing shall be conducted on each host processor in the system. A tool enabling the required spare portion of memory to be made unavailable to the training system software (IBM AIX performance aid toolset, 'rmss' utility or equivalent) shall be used for the spare memory capacity test. With a training scenario executing, the tool shall be used to mark off progressively larger blocks of real memory until the amount of memory marked off is greater than or equal to the required amount of spare memory. Under each of these reduced memory conditions and while running the training scenario, the contractor shall monitor virtual memory disk paging activity for a minimum of 30 contiguous seconds (IBM AIX tool 'vmstat' or equivalent). No significant increase in the average virtual memory page-in and page-out activity (compared to the baseline paging activity with all memory available) shall be evidence that the spare memory requirement has been met. A significant increase in the average virtual memory page-in and page-out activity (compared to the baseline paging activity with all memory available) indicates a memory starvation condition. In this case, a government-approved subset of trainer system operational response time requirements shall be reverified, and if met, shall be evidence that the spare memory requirement has been met.
- b. The spare disk capacity requirement of paragraph 3.7.3.1.4.b shall be tested by measuring disk usage on each type of module and workstation in the system. A utility shall be used to perform the test and capture the output for analysis and record purposes (such as IBM AIX "lsvg" utility or equivalent).

- c. The spare time (paragraph 3.7.3.1.4.c) capacity test shall be conducted using a worst case performance test which consists of a training scenario running while both the required spare memory is unavailable, and the required amount of spare time is consumed or is otherwise made unavailable to the application software. A tool enabling the required spare portion of memory to be made unavailable to the training system software (IBM AIX Performance Aid toolset, 'rmss' utility or equivalent) shall be used. A tool or utility which executes as a non-preemptable high priority process shall be used to consume the required amount of spare time in each execution loop (frame) of the simulation application software. A software tool capable of measuring processing time performance of each subprocessor within a cpu (such as IBM's "utld" tool or equivalent) shall be used. The tool shall be capable of generating a test data output which can be captured for record and analysis purposes.
- d. Testing for the spare input and output capacity requirement, paragraph 3.7.3.1.4.d, shall be conducted by examination of the number of spare and used input and output channels in each type of module and workstation.

4.5.12 LAN.

The capabilities of the LAN (3.7.4-3.7.4.5 and 3.2.5) shall be demonstrated by the successful completion of situational training exercises (see 6.2) conducted individually and simultaneously; ~~on terrain and environment, and using the maximum module capability that the network can hold.~~ Requirement verification shall be accomplished through examination and analysis. Spare network capacity test shall be performed by connecting a commercial local area network analyzer to collect the test data. A worst case battalion exercise with 1700 entities, or an 880-entity exercise (such as "TFBN1_Hood" and "TFBN2-Hood") with the results extrapolated to 1700 entities shall be used for this test. Network traffic shall be monitored during the entire duration of the exercise in order to determine the short-term worst case network utilization and the average steady-state network utilization.

4.5.13 Visual System.

The visual system for the CCTT shall be evaluated as described in the subparagraphs herein to verify that the requirements as described in Section 3 and Appendix A have been satisfied.

4.5.13.1 Mechanical Interface

The mechanical interface of the visual system (A.3.1.1.1) shall be examined to verify proper positioning and structural support of the components of the visual display system.

4.5.13.2 Electronic Interface

Examination and demonstration via system scenario execution (see 6.2) shall be performed to verify all electronic interface requirements (A.3.1.1.2) have been met.

4.5.13.3 Software interface

Examination and demonstration via system scenario execution (see 6.2) shall be performed to verify that the software interface of the visual system requirements (A.3.1.1.3) have been met.

4.5.13.4 Major components

The visual system shall be examined to verify that it consists of the specified components (A.3.1.2.1 - A.3.1.2.4).

4.5.13.5 Performance

The visual system shall be demonstrated and tested via system scenario execution (see 6.2) to verify that CCTT performance requirements (A.3.2.1) have been met.

4.5.13.5.1 General training scene requirements

System scenario execution (see 6.2) shall be used to verify that the specified training scene requirements and capabilities (A.3.2.1.1.) have been adequately provided for all visual displays.

4.5.13.5.1.1 Range of Vision

The range of vision requirements (A.3.2.1.1.1) shall be demonstrated via system scenario execution (see 6.2).

4.5.13.5.1.2 Vehicle simulation

Demonstrate via system scenario execution (see 6.2) that the displayed images depict the speed, path and attitude of the simulated vehicles; that the movement of vehicles through the visual environment are correctly influenced by the terrain slope, surface material (soil type), water depth, and vegetation size and density, so that the same limitations on motion exist as in the real world; and that the simulated vehicles are capable of being placed anywhere in the gaming environment at initialization.

4.5.13.5.1.3 Ground missile combat

Demonstrate via system scenario execution (see 6.2) that the visual system depicts missile rocket motor launch signature, gunner's sight obscuration after launch, guided missile flight, and weapons burst on or near the target; and that when a ground target is hit the displayed image presents the appropriate weapons effect and kill indication. Demonstrate that ground engagements are visible to units for which either the attacking unit, the attacked target or both are within visibility limits.

4.5.13.5.1.4 Ground mounted combat

Verify via system scenario execution (see 6.2) that the CCTT visual system generates, in real-time, displayed images of the simulated battlefield which depict the movement and engagement of stationary and moving vehicles , including dismounted infantry.

4.5.13.5.1.5 Ground dismounted combat

Verify via system scenario execution (see 6.2) that the requirements of paragraph A.3.2.1.1.5 have been met.

4.5.13.5.1.6 Ground-to-air-combat

Demonstration of the requirments in paragraph A.3.2.1.1.6 shall be accomplished via system scenario execution (see 6.2). Demonstrate that weapons employment by and against aircraft is depicted; ground to air guided weapons flight, and weapons bursts on or near the target are depicted; and when aircraft are hit by ground based weapons, a weapons effect consistent with the type of weapon and its point of impact or detonation is provided.

4.5.13.6 Special real-time processing

4.5.13.6.1 Atmospheric and meteorological effects

The atmospheric and meteorological effects requirements of Appendix A paragraph A.3.2.1.2.1 shall be verified as described in 4.5.13.6.1.1 through 4.5.13.6.1.5.

4.5.13.6.1.1 Ambient visibility (haze)

Demonstration and testing via system scenario execution (see 6.2) shall be performed to verify that all specified ambient visibility (haze) requirements have been adequately provided. The attenuation of light by the atmosphere in areas not occupied by other obscurants shall be verified as present through simulation of haze. The nominal visibility for the haze shall be examined and demonstrated to be adjustable in range from zero to at least 20.0 km in increments of 0.5 kilometers or less. The obscuration of scene elements as a function of range shall be verified to approximate real world characteristics except as necessary for short periods of scene management. Variation of haze with altitude shall be demonstrated for line of sight fading of air targets.

4.5.13.6.1.2 Fog simulation

Demonstration and testing via system scenario execution (see 6.2) shall be performed to verify that all specified fog simulation requirements have been adequately provided. Fog shall be examined to verify it is modeled as having a distinct white hue. The fog density shall be examined and verified to be adjustable from the ground to an altitude of 2000 feet (selectable from the MCC in 5 foot increments for the first 50 feet, 50 foot increments from 50 to 500 feet, and 500 foot increments for the remainder). The visibility reduction due to fog shall be demonstrated to be proportional to the line of sight range through the fog to each point in the scene. The maximum fog range setting shall be demonstrated to remove all fog effects.

4.5.13.6.1.3 Cloud simulation

Demonstration and testing via system scenario execution (see 6.2) shall be performed to verify that the specified cloud simulation requirements have been adequately provided. The ceiling height shall be examined and verified of being set to the range and increments specified. The capability to simulate an overcast sky with obscuration of objects above the cloud base shall be demonstrated. The appearance of a cloud layer shall be verified to be simulated by an appropriate image (pixel) data or texture. Ceiling height shall be verified as selectable from 0 to at least 10,000 feet in 100-foot increments or less.

4.5.13.6.1.4 Rain simulation

It shall be verified through demonstration via system scenario execution (see 6.2) that the specified rain simulation requirements have been adequately provided. Visibility attenuation due to rain shall be verified. On/off control of rain shall be demonstrated.

4.5.13.6.1.5 Sky and horizon

Demonstration via system scenario execution (see 6.2) shall be performed to verify that the colors and brightness requirements for the sky and horizon have been adequately provided. Presence of a sky and horizon shall be verified. The unfaded sky color shall be verified as a sky blue. The sky brightness and color shall be demonstrated to vary as a function of visibility effects and illumination from blue to shades of grey. Dusk and dawn horizons shall be verified

as present and simulated as a lower intensity grey with an orange glow on the east or west horizon respectively, and shall be demonstrated to be selectable.

4.5.13.6.2 Illumination

Demonstration shall be performed to verify that the illumination of the visual scene requirements (A.3.2.1.2.2) have been adequately provided. The intensity and position of the illumination source shall be represented. The total illumination shall be a combination of directional and diffuse illumination. The ratio of directional to diffuse illumination shall be correct for the illumination source being simulated. Natural illumination shall contain sufficient directionality to reveal the shape and orientation of objects. The ratio of directional to diffuse illumination shall be a readily programmable constant for sources, which contain both.

4.5.13.6.3 Time of day

The time of day requirements (A.3.2.1.2.2.1) shall be verified by loading a database consisting of terrain faces, culture layers, natural objects, moving models, and weapons effects. Day, overcast day, dawn/dusk, moonlit night, starlit night, and the additional levels for night illumination shall be performed to demonstrate the effects of brightness, coloring, contrast, intensity and shading variations. Additional night illumination appropriate for night vision light intensification devices shall be verified.

4.5.13.6.4 Artificial illumination.

4.5.13.6.4.1 Flare illumination

Demonstration shall be performed to verify that the flare illumination requirements of (A.3.2.1.2.2.2.1) have been met. Flare locations shall be fixed by grid coordinates provided through the Fire Direction Center, FIST-V or Field Artillery Battalion Tactical Operations Center and preprogrammed direction set in the system at the beginning of the system scenario execution (see 6.2) . Two types of flares, the illumination round for the 120mm mortar and the M485A2 illumination round for the 155mm Howitzer shall be selectable. Brightness, intensity, area illuminated and burn time shall be representative of the type of flare simulated. Multiple flares may be represented as a composite flare with a single flare source and attached light points. The system shall support at least two simultaneous single or multiple flares. Location of flares and its illumination shall be restricted to the range limitations of the weapon system firing and the flare's own characteristics.

4.5.13.6.4.2 Light points

Demonstration shall be performed to verify that the requirements for light points (A.3.2.1.2.2.2.2) have been met.

4.5.13.6.4.3 Light point intensity control

Demonstration shall be performed to verify that the requirements for light point intensity control (A.3.2.1.2.2.2.3) have been met.

4.5.13.6.5 Tactical smoke

The requirements for smoke effects shall be demonstrated via system scenario execution (see 6.2) to verify conformance with the requirements A.3.2.1.2.3 of this specification. Demonstration shall be performed to verify that smoke effects requirements (A.3.2.1.2.3) have

been met. The simulation shall include the appropriate effects for different delivery systems (e.g. grenade), appearance, dissipation time, growth, size, shape, vision impairment, Infra-Red (IR) shielding, and target silhouetting. The smoke of the visual and sensor scenes shall be simulated with different transmittances appropriate to the scene display mode, i.e., visible, image intensification, and thermal. The laser range finder shall be appropriately degraded due to smoke.

4.5.13.6.6 Own-vehicle dynamics

Demonstration shall be performed via system scenario execution (see 6.2) to verify that own-vehicle dynamics requirements (A.3.2.1.2.4.1) have been met.

4.5.13.6.7 Moving, ~~repositioning~~, and switchable models

Demonstration, testing, and analysis shall be performed to verify moving, ~~repositionable~~, and switchable model requirements (A.3.2.1.2.4.2) have been met. Demonstration shall be performed via system scenario execution (see 6.2).

Ground vehicles shall be verified follow the contour of the terrain. Air vehicles shall be verified to follow flight paths computed by the related vehicle consoles. The system must simultaneously support all the positioning, environment feedback and display processing associated with columns I, II and III.

	I	II	III
	In Active	Displayed Per	Displayed
	Area For each	Module/Console	Per Channel
Vehicles	150	100	20
Immobilized Vehicles	50	35	10
In-flight missiles/Projectiles	35	20	5
Animation and Special Effects	35	20	5
Misc. Relocatable Objects	20	10	5
Tactical Smoke	15	7	3

The above listed quantities define a specific, nominal test situation which the module's or console's system shall be able to accommodate. Presence of a scene management process to allow real-time reallocation of processing resources to accommodate other combinations of entities shall be verified.

4.5.13.6.8 Animation and special effects

4.5.13.6.8.1 Propeller ~~and~~ Rotor discs

Demonstration via system scenario execution (see 6.2) shall be performed to verify that the propeller ~~and~~ rotor disc requirement (A.3.2.1.2.4.3.1) has been met.

4.5.13.6.8.2 Visible weapons effects

Demonstration via system scenario execution (see 6.2) shall be performed to verify that the visible weapons effect requirements (A.3.2.1.2.4.3.2) have been met. Regardless of firing platform location, when a weapon impacts on targets, terrain, or features and said impact is within both the FOV and detection limits of active eyepoint(s), the corresponding weapons impact effect shall be visually depicted for all such eyepoints (the only exception to this is that small arms fire impacts may be grouped into a composite impact for automatic weapon's fire).

4.5.13.6.8.3 Air-to-ground weapon effects

Demonstration via system scenario execution (see 6.2) shall be performed to verify that for the air-to-ground weapons effects requirements (A.3.2.1.2.4.3.2.1) have been met.

4.5.13.6.8.4 Weapons fire and weapons impact effect

Demonstration via system scenario execution (see 6.2) shall be performed to verify that for weapons fire and weapons impact effects requirements (A.3.2.1.2.4.3.2.2) have been met.

4.5.13.6.8.5 Tracer simulation

Demonstration via system scenario execution (see 6.2) shall be performed to verify that tracer requirements (A.3.2.1.2.4.3.2.2.1) have been met. The tracer simulation shall be verified to be consistent with the weapon being fired and realistically represent the rate of fire. For tracers originating from weapons attached to a given simulator module, the proper tracer trajectory and occultation shall be visually displayed for the crew stations of that module (i.e. Ownvehicle Tracers). A simplified tracer simulation for tracers generated by weapons external to the simulator module (i.e. Crossing Tracers) shall be verified for up to four weapons per firing platform model.

4.5.13.6.8.6 Dust trail

Demonstration via system scenario execution (see 6.2) shall be performed to verify that dust trail requirements (A.3.2.1.2.4.3.3) have been met. The effect of the dust trail generated by ground vehicles when and only when traversing dry dirt or sand areas shall be verified as visually simulated. The effects of vehicle type and direction of movement (forward and reverse) on dust trail simulation, and variation in dust trail transparency, general appearance, and size with the size being based on vehicle speed shall be verified. A minimum of five sizes of dust trail shall be verified as simulated; three for forward motion and two for reverse motion with the size being based on vehicle speed.

4.5.13.6.8.7 Simulated position

Testing and analysis shall be performed to verify that simulated position requirements (A.3.2.1.2.5.1) have been met.

4.5.13.6.8.8 Laser range finder

Demonstration via system scenario execution (see 6.2) and analysis shall be performed to verify that the laser range finder requirements (A.3.2.1.2.5.2) have been met. The laser range finder computation shall be analyzed to verify that it is based on the look direction designated by the host and the intersection of the associated line of sight with visual environment polygons. The

laser range finder simulation shall be demonstrated to address the effect of obscurants (i.e. tactical smoke) on the range finders.

4.5.13.6.8.9 Gaming area

Demonstration via system scenario execution (see 6.2) shall be performed to verify that the gaming area requirements (A.3.2.1.2.5.3) have been met. Throughout the gaming area, transitions between active areas shall be verified as transparent to the operator.

4.5.13.6.9 Image quality, general

4.5.13.6.9.1 Visual image sharpness

Testing shall be performed to verify that the visual image sharpness of the displayed image requirements (A.3.2.1.3.2) have been met. Displayed image sharpness shall be measured with a test pattern with multiple sets of alternate, equal width dark and light bars (50 percent duty cycle) modeled after the 1951 USAF Resolution Test Chart and generated by the image generator. In each set of resolution bars, one set of bars shall be parallel to the raster lines and the other perpendicular. The test pattern shall contain a minimum of five cycles of resolution bars to cover the entire range of resolution to be measured (one cycle of resolution bars shall cover a 2:1 range of resolution). The test patterns shall be generated in exactly the same manner as the graphics imagery used for training. The pattern shall be easily relocatable throughout the FOV and movable in increments of less than one-quarter pixel around the test positions. The modulation transfer function shall be at least 10 percent when viewed on the display, from the nominal eyepoint locations for all positions of the test pattern. The term optical line pair (OLP) in the following paragraphs shall be defined as one light and one dark bar in the test pattern within the FOV. The specific image sharpness requirements of Appendix A are based on the use of reasonably effective anti-aliasing and a Kell factor of 0.7.

4.5.13.6.9.2 Surface resolution

Testing shall be performed to verify that the surface resolution requirements (A.3.2.1.3.2) have been met. Surface resolution shall be determined based on a test pattern of alternate, equal width, dark and light bars (50 percent duty cycle). Resolution is the test pattern spacing at which the Modulation Transfer Function (MTF) is 10 percent viewed on the display and including all system elements including image generator, display device and intervening optics and measured in Arc-minutes/Optical Line Pair [One dark bar and one light bar constitute an Optical Line Pair (OLP)]. Multiple sets of alternate light bars and dark bars each shall be provided in the pattern with the sets perpendicular to each other as in the standard 1951 USAF resolution chart. One set shall be parallel to the raster lines.

4.5.13.6.9.3 Light point resolution

Testing shall be performed to verify that the light point resolution requirements (A.3.2.1.3.2) have been met. The light point resolution shall be the same as surface resolution and shall be computed as the average spacing between light point centers in an almost merged, 40 X 40 array of anti-aliased light points. The term almost-merged array is defined as being analogous to the 10 percent MTF specified for surface resolution and the lights points are readily discernible as separate rows and columns. All measurements shall be in arc-minutes.

4.5.13.6.9.4 Luminance

Testing shall be performed to verify that the luminance requirements (A.3.2.1.3.3) have been met. Luminance shall be tested with a white polygon displayed at the maximum simulated illumination. The polygon shall be generated and displayed using the visual simulation processing normally used for training. The polygon shall be normal to the illumination direction, illuminated under the average brightest sunlight conditions without atmospheric attenuation. Luminance shall be determined as the average luminance for a uniform array of test points. Local "hot spots" shall not be used for the measurements at the test points. For other than direct view CRT's luminance is specified for a 20 percent duty cycle, where duty cycle is the percentage of the channel area which is illuminated. The 20 percent duty cycle requirement shall be met with a continuous, rectangular illuminated screen area with the long dimension parallel to the raster lines. For direct view CRT monitors a full-screen white surface test pattern shall be used to measure the above-specified luminance. Measurements shall be made from the design eye location of each display through all intervening optics.

4.5.13.6.9.5 Luminance variation

Testing shall be performed to verify that the luminance variation requirements (A.3.2.1.3.3.1) have been met. Initial measurements shall be taken after a 45 minute warm-up (only exception: 15 minutes for direct view CRT monitors) and adjustment period. Luminance shall be uniform to within +/- 50 percent of the central area luminance over the entire vertical and horizontal FOV for each display channel. Luminance shall be uniform to within 20 percent across boundaries of similar adjacent displays. Luminance at each point in the display shall not vary by more than 20 percent (only exception: 10 percent for direct view CRT monitors) when viewed from any two points within the specified viewing volume.

4.5.13.6.9.6 Contrast

Testing shall be performed to verify that the contrast ratio requirements (A.3.2.1.3.4) have been met. The contrast ratio shall be tested using a checkerboard test pattern (all displays illuminated with the test pattern simultaneously). The pattern must provide at least 16 squares per display channel with 50 percent of the squares at the specified maximum luminance. The test pattern shall be generated using the same type scene model (developed by the same methods) and image processing as is used for training. Measurements shall be made through all intervening optics.

4.5.13.6.9.7 Color

An analysis shall be performed to verify that the color requirements (A.3.2.1.3.5) have been met. The analysis shall verify that not less than 128 colors, each capable of being a different hue, shall be available for polygon and object color definition and that the 128 colors are selectable from a set of not less than 4096 colors. For thermal (IR) and image intensifier simulation, the 128 levels shall be verified as capable of representing 128 different intensity values out of a set of 4096. At the output, not less than 256 intensity levels of each color primary shall be verified.

4.5.13.6.9.7.1 Color processing

Testing shall be performed to verify that the color processing requirements (A.3.2.1.3.5.1) have been met. The absence of visible instantaneous changes in color and intensity due to changes in fading and shading as the eyepoint moves through the scene shall be verified. The computed

color and intensity shall be verified to be a function of reflectance, luminance, illumination magnitude and direction, range and atmospheric effects.

4.5.13.6.9.8 Image perspective and geometric accuracy

The image perspective and geometric accuracy requirements (A.3.2.1.3.6) shall be verified by examination and demonstration.

4.5.13.6.9.8.1 Total geometric accuracy

Testing shall be performed to verify that the geometric accuracy requirements (A.3.2.1.3.6.1) have been met. Total geometric distortion is the error in apparent location for any point in the scene relative to the true projected position expressed as a percentage of specified channel dimension in the narrow direction. The total geometric distortion for each display shall not exceed five percent within a circle whose diameter is 0.6X the display channel diagonal, centered at the channel center as measured from the selected trainee eyepoints. Elsewhere in each display channel, distortion shall not exceed seven percent.

4.5.13.6.9.8.2 Relative geometric errors

The relative geometric errors shall be tested to verify conformance with the specification paragraph A.3.2.1.3.6.2. Within a circle centered on the channel and whose diameter is equal to display's long dimension, geometric errors in scene points relative to nearby scene points shall not exceed six arc minutes within any two degree cone of vision. Outside the circle the relative geometric error shall not exceed ten arc minutes within any two degree cone of vision.

4.5.13.6.9.9 Vernier resolution

Testing shall be performed to verify that the vernier resolution requirements (A.3.2.1.3.7) have been met. Vernier resolution, measured as the minimum discernible apparent displacement of adjacent scene elements and as the minimum detectable relative motion of a scene element relative to the eye, shall be less than 20 percent of the resolution (Optical Line Pair (OLP) spacing) specified for each display.

4.5.13.6.9.10 Adjacent channel matching

Testing shall be performed to verify that the adjacent channel matching requirements (A.3.2.1.3.8) have been met. For popped hatch, CWS, and the vision blocks, the gap (discontinuity) in what should be a continuous scene shall be no larger than 2 degrees as measured from the design eyepoint. For the DI and HMMWV, a gap of 5 degrees ~~shall~~ is be allowed. For the AAR console, a gap of 10 degrees ~~is~~ shall be allowed. For displays with adjacent channels, that part of the scene that would fall within the gap in what should be a continuous scene shall be displayed by the surrounding displays.

4.5.13.6.9.11 Image stability

Demonstration and testing shall be performed to verify that the image stability requirements (A.3.2.1.3.9) have been met.

4.5.13.6.9.12 Video rate

The video rate requirements (A.3.2.1.3.10) shall be verified by demonstration.

4.5.13.6.9.13 Update rate

The update rate requirements (A.3.2.1.3.11) shall be verified by demonstration and analysis.

4.5.13.6.9.14 Transport delay

Testing and analysis shall be performed to verify that transport delay requirements (A.3.2.1.3.12) have been met. The transport delay test shall be performed with an oscilloscope attached to the image generator.

4.5.13.6.9.15 Occulting

The occulting or hidden surface elimination requirements (A.3.2.1.3.13) shall be verified by demonstration.

4.5.13.6.9.16 Smear

The smear requirements (A.3.2.1.3.14) shall be verified by demonstration.

4.5.13.6.9.17 Flicker

The flicker requirements due to image refresh (A.3.2.1.3.15) shall be verified by demonstration.

4.5.13.6.9.18 Stepping

The stepping requirements (A.3.2.1.3.16) shall be verified by demonstration.

4.5.13.6.10 Image quality (system capacity)

4.5.13.6.10.1 Continuous image intensity

Demonstration, testing, and analysis via system scenario execution (see 6.2) shall be performed to verify that the continuous Image density requirements (A.3.2.1.4.1) have been met.

4.5.13.6.10.1.1 Feature selection

Demonstration and analysis shall be performed to verify that the feature selection requirements (A.3.2.1.4.1.1) have been met.

4.5.13.6.10.2 Scene content management

Demonstration and analysis shall be performed to verify that the scene content management requirements (A.3.2.1.4.2) have been met.

4.5.13.6.10.2.1 Scene management mechanisms

Demonstration and analysis shall be performed to verify that the scene management mechanism requirements (A.3.2.1.4.2.1) have been met.

4.5.13.6.10.2.2 Environment integrity

Demonstration and analysis shall be performed to verify that the environment integrity requirements (A.3.2.1.4.2.2) have been met.

4.5.13.6.10.2.3 Scene management dynamics

Demonstration and analysis shall be performed to verify that the scene management dynamics requirements (A.3.2.1.4.2.3) have been met.

4.5.13.6.10.2.4 Overload prevention

Demonstration and analysis shall be performed to verify that the overload prevention requirements (A.3.2.1.4.2.4) have been met.

4.5.13.6.11 Display configurations

Demonstration and examination shall be performed to verify that the display configuration requirements (A.3.2.1.5) have been met. The verification of an attitude sensor, e.g., head tracker, will be performed as part of the entire visual system test and again as part of the entire module system test.

4.5.13.6.11.1 Full circle vision block configurations

Demonstration via system scenario execution (see 6.2) and examination shall be performed to verify that the full circle periscope mosaics requirements (A.3.2.1.5.1) have been met.

4.5.13.6.11.2 Popped hatch displays

Demonstration via system scenario execution (see 6.2) and examination shall be performed to verify that the popped hatch displays requirements (A.3.2.1.5.2) have been met.

4.5.13.6.11.3 Driver displays

Demonstration via system scenario execution (see 6.2) shall be performed to verify that the driver displays requirements (A.3.2.1.5.3) have been met.

4.5.13.6.11.4 Loader displays

Demonstration via system scenario execution (see 6.2) shall be performed to verify that the loader displays requirements (A.3.2.1.5.4) have been met.

4.5.13.6.11.5 Sights (primary, backup, and extension, (optical and thermal))

Demonstration via system scenario execution (see 6.2) shall be performed to verify that the gunners primary sight and extension site requirements (A.3.2.1.5.5) have been met.

4.5.13.6.12 Module/Console specific FOV and resolution requirements

Testing shall be performed to verify that the Module/Console specific FOV and resolution requirements (A.3.2.1.6) have been met.

4.5.13.6.12.1 M1A1/M1A2 tank module

Testing shall be performed to verify that the M1A1/M1A2 tank visual displays requirements (A.3.2.1.6.1) have been met.

4.5.13.6.12.2 M2A2 Infantry fighting vehicle and M3A2 cavalry fighting vehicle module

Testing shall be performed to verify that the The M2A2 Bradley Fighting Vehicle and the M3A2 Cavalry Fighting Vehicle visual displays requirements (A.3.2.1.6.2) have been met.

4.5.13.6.12.3 M981 fire support team vehicle module (FIST-V)

Testing shall be performed to verify that the M981 Fire Support Team Vehicle visual displays requirements (A.3.2.1.6.3) have been met.

4.5.13.6.12.4 M113A3 armored personnel carrier (APC)

Testing shall be performed to verify that the M113 Armored Personnel Carrier visual displays requirements (A.3.2.1.6.4) have been met.

4.5.13.6.12.5 High mobility multipurpose wheeled vehicle (HMMWV) module

Testing shall be performed to verify that the HMMWV visual displays requirements (A.3.2.1.6.5) have been met.

4.5.13.6.12.6 Dismounted infantry (DI) module

Testing shall be performed to verify that the Dismounted Infantry (DI) visual displays requirements (A.3.2.1.6.6) have been met.

4.5.13.6.12.7 After action review console - visual display

Testing shall be performed to verify that the AAR console visual displays requirements (A.3.2.1.6.7) have been met.

4.5.13.6.12.8 After action review - debrief display

Testing shall be performed to verify that the AAR debrief display requirements (A.3.2.1.6.8) have been met.

4.5.13.6.12.9 Tactical Air Control Party console - visual display

Testing shall be performed to verify that the TACP visual displays requirements (A.3.2.1.6.9) have been met.

4.5.13.6.12.10 Electro-optics sensor image simulation

Demonstration and examination via system scenario execution (see 6.2) shall be performed to verify that the ~~E~~lectro-optics sensor image simulation requirements (A.3.2.1.7) have been met.

4.5.13.6.12.10.1 Sensor image database

Demonstration and analysis via system scenario execution (see 6.2) shall be performed to verify that the ~~S~~sensor ~~I~~image ~~D~~atabase requirements (A.3.2.1.7.1) have been met.

4.5.13.6.12.10.2 Thermal sight image simulation

Demonstration and analysis via system scenario execution (see 6.2) shall be performed to verify that the thermal sight image simulation requirements (A.3.2.1.7.3) have been met.

4.5.13.6.12.10.3 Night vision image intensifier

Demonstration and analysis via system scenario execution (see 6.2) shall be performed to verify that the Night vision image intensification simulation (A.3.2.1.7.4) have been met.

4.5.13.6.12.10.4 Laser range finder

Demonstration and testing via system scenario execution (see 6.2) shall be performed to verify that the Laser range finder simulation requirements (A.3.2.1.7.5) have been met.

4.5.13.7 Major Components Characteristics.

4.5.13.7.1 Image generator subsystem

Demonstration, testing, and analysis via system scenario execution (see 6.2) shall be performed to verify that the ~~I~~image ~~G~~enerator ~~S~~ubsystem requirements (A.3.3.1) have been met.

4.5.13.7.1.1 Image generation system throughput

Demonstration and analysis via system scenario execution (see 6.2) shall be performed to verify that the ~~i~~Image ~~g~~eneration ~~s~~ystem throughput requirements (A.3.3.1.1) have been met.

4.5.13.7.1.2 Displayed image artifacts

Demonstration and analysis via system scenario execution (see 6.2) shall be performed to verify that the ~~D~~isplayed ~~I~~image ~~A~~rtifacts requirements (A.3.3.1.2) have been met.

4.5.13.7.1.2.1 Anti-aliasing

Demonstration and analysis via system scenario execution (see 6.2) shall be performed to verify that the ~~A~~anti-~~A~~lising requirements (A.3.3.1.2.1) have been met.

4.5.13.7.1.3 Special image generator processing

Demonstration and analysis via system scenario execution (see 6.2) shall be performed to verify that the ~~S~~pecial ~~I~~image ~~G~~enerator ~~P~~rocessing requirements (A.3.3.1.3) have been met.

4.5.13.7.1.4 Texture

Demonstration and analysis via system scenario execution (see 6.2) shall be performed to verify that the ~~M~~apping of image data onto environment polygons requirements (A.3.3.1.4) have been met.

4.5.13.7.1.4.1 Mapping

Demonstration and analysis via system scenario execution (see 6.2) shall be performed to verify that ~~I~~image data mapping requirements (A.3.3.1.4.1) have been met.

4.5.13.7.1.4.2 Anti-aliasing and blending

Demonstration and analysis via system scenario execution (see 6.2) shall be performed to verify that ~~I~~image data anti-aliasing and blending requirements (A.3.4.3.4.2) have been met.

4.5.13.7.1.4.3 Dynamic texture

Demonstration and analysis via system scenario execution (see 6.2) shall be performed to verify that ~~D~~ynamic texture patterns requirements (A.3.3.1.4.3) have been met.

4.5.13.7.1.5 Database storage capacity

Demonstration, testing, and analysis via system scenario execution (see 6.2) shall be performed to verify that the ~~D~~atabase storage capacity requirements (A.3.3.1.5) have been met.

4.5.13.7.1.6 Improved IG performance

Demonstration and analysis via system scenario execution (see 6.2) shall be performed to verify that the potential for ~~I~~Improved IG performance requirements (A.3.3.1.6) have been met.

4.5.13.7.2 Image display subsystem

Demonstration, testing, analysis, and examination shall be performed to verify that the Image ~~D~~isplays ~~S~~ubsystem requirements (A.3.3.2) have been met.

4.5.13.7.2.1 Optics

Demonstration and examination shall be performed to verify that the ~~O~~ptics requirements (A.3.4.2.1) have been met.

4.5.13.7.2.3 Magnified displays

Demonstration, testing, analysis, and examination shall be performed to verify that the ~~M~~magnified ~~S~~sight ~~D~~displays requirements (A.3.4.2.2) have been met.

4.5.14 Communication System.

The communication system and its capabilities shall be verified by test. This shall be performed by conducting training exercises and component level acceptance test procedures as specified in 6.2. The tests shall demonstrate the capabilities of the communication equipment provided with each module and console, communication monitoring and external communication (module-to-module, and module-to-OC) can be performed. It shall be demonstrated that the radio configurations replicates the new SINCGARS series of radio, and that the communication system provides the required elements and configurations as specified in 3.7.6. through 3.7.6.3.1.

4.5.15 SAF.

The SAF ~~C~~onfiguration ~~I~~tem for CCTT shall be inspected and demonstrated to verify that the requirements as described in this specification paragraph 3.7.7 and Appendix D have been satisfied.

4.5.15.1 Multiple Exercises.

The capability of the SAF ~~C~~onfiguration ~~I~~tem to control units of both BLUFOR and OPFOR units in one to five simultaneous exercises as specified in D.3.1 shall be demonstrated via scenario execution (see 6.2).

4.5.15.1.1 SAF workstation.

The SAF workstation (D.3.1.1.1) shall be examined and tested through system exercise (see 6.2) to verify that the visual displays and user interfaces to control and monitor the performance of the SAF are provided. The furniture and chairs requirement of paragraph D.3.1.1.5 shall be verified by examination.

4.5.15.1.1.1 Map display.

The SAF workstation's map display requirements of D.3.1.1.1 shall be verified by examination and demonstration. Demonstration shall be performed via execution of system scenario (see 6.2).

4.5.15.1.1.2 Displays operation.

The SAF workstation's display requirements of D.3.1.1.1 shall be verified by demonstration via execution of system scenario (see 6.2).

4.5.15.1.1.2 Keyboard.

The SAF workstation shall be examined to verify that a keyboard and mouse (D.3.1.1.1.3) are provided.

4.5.15.1.3 Network interface.

The requirements of network interface of paragraph D.3.1.1.2 shall be verified with the demonstrations of paragraph 4.5.12 of this specification.

4.5.15.1.3 Communications network.

The requirements of communications network of paragraph D.3.1.1.3 shall be verified by demonstration and test. The demonstration and test may be combined with the demonstrations and tests of paragraph 4.5.14.

4.5.15.1.4 Computer system.

The computer system requirements of D.3.1.1.4 shall be verified by examination and demonstration. The examination and demonstration may be combined with the examination and demonstration of paragraph 4.5.10.

The printer requirements of paragraph D.3.1.1.4.1 shall be verified by examination and demonstration. The database storage capacity and timing requirements of paragraph D.3.1.1.4.2 shall be verified by examination and demonstration.

4.5.16 M1A1 Module.

~~For Group A tests~~ ~~the M1A1 Module provided for the CCTT system shall be examined, demonstrated and tested through the use of the Acceptance Test Procedure 121695 (or equivalent).~~ ~~and For Group B tests~~ ~~selected system scenarios (see 6.2).~~ ~~will be executed for~~ ~~verification of requirements included in Appendix F, module common performance requirements paragraphs 3.6 through 3.6.7 and system design requirements of paragraphs 3.2 through 3.2.1.~~ ~~shall be performed.~~ Generation of Failure any priority 1 or 2 PTRs (with exception of documented or latent PTRs within the government furnished software) e to meet the requirements in Appendix F, paragraphs 3.6 through 3.6.7 and 3.2 through 3.2.1 shall constitute a test failure of this test. Retesting shall be confined to execution of scenarios necessary to verify proper operation of a failed function. Correction of priority 3 through 5 PTRs shall be as specified in the contract (see 6.2).

4.5.16.1 Sound Generation System.

It shall be verified through test that the sound generation system performs as specified in paragraphs F.3.1.1.7 through F.3.1.1.7.7. For Group A tests this test shall be performed through the use of Acceptance Test Procedure 121695 in order to demonstrate sound cues are present. Sound synchronization and spatial positioning shall be demonstrated via system training exercise (see 6.2). For First Article tests vehicle sounds shall be measured at two-thirds throttle in drive mode along a surface simulating a paved, smooth, and level road. Measurements shall be taken at the ear position of each operator or crew position. The sound level meter shall conform to requirements for Type 1, as specified by ~~ANSI~~ S1.4 and shall be calibrated in accordance with the sound level meter manufacturer's instructions. Calibrators shall conform to ~~ANSI~~ S1.40 and shall address the influence of microphones, cables, amplifiers, and recorders.

4.5.16.2 Communication System.

It shall be verified by examination and demonstration that the M1A1 module provides the loader, gunner, tank commander, and driver stations with the radio and intercom capabilities specified in paragraph 3.7.6. Verification of performance and compliance with the requirements shall be accomplished by conducting a training exercise that will allow for communication between crew members (via the use of the intercom select switches), OC and other modules in the simulation.

4.5.16.3 Visual Display System.

The visual display requirements of paragraph F.3.1.1.1 shall be verified as specified in Table XII.

4.5.16.4 Physical Characteristics.

The M1A1 simulator module shall be examined to verify that it is provided with a driver and a turret compartment complying with the physical characteristics requirements specified in paragraph F.3.1.2. Test of all quantitative requirements related to forces, dead bands, deflection, torque, throw and rates for the controls and switches specified in paragraph F.3.1.2 through F.3.1.2.2.6 shall be performed. Failure to fall within the tolerances specified in the requirements shall constitute failure of the test.

4.5.16.4.1 Controls and Indicators.

For Group A tests it shall be demonstrated by the use of Acceptance Test Procedure 121695 that design of controls and indicators for the M1A1 module is in accordance with the requirements of paragraphs F.3.1.2.1 through F.3.1.2.2.6. For first article tests a random sample of not more than 50 ~~percent~~% of controls and indicators of the individual crew stations, specified in paragraphs F.3.1.2.1 through F.3.1.2.2.6, will be selected to verify appropriate location, operability and realism. Presence of one or more defects shall be cause for rejection of the unit.

4.5.16.5 External Interface Unit.

It shall be verified by examination and system scenario execution that the M1A1 module provides the external interface unit as specified in paragraph F.3.1.2.3.

4.5.17 M2A2/M3A2 Module.

For Group A tests The M2A2/M3A2 Module provided for the CCTT system shall be examined, demonstrated and tested through the use of Acceptance Test Procedure 121697 (or equivalent). For Group B tests and selected system scenarios (see 6.2), will be executed for ~~Verification of~~ requirements included in Appendix G, module common performance requirements paragraphs 3.6 through 3.6.7 and system design requirements of paragraphs 3.2 through 3.2.1 ~~shall be performed. Failure to meet the requirements in Appendix G, paragraphs 3.6 through 3.6.7 and 3.2 through 3.2.1 shall constitute failure of this test~~ Generation of any priority 1 or 2 PTRs (with exception of documented or latent PTRs within the government furnished software) shall constitute a test failure. Retesting shall be confined to execution of scenarios necessary to verify proper operation of a failed function. Correction of priority 3 through 5 PTRs shall be as specified in the contract (see 6.2).

4.5.17.1 Sound Generation System.

It shall be verified through test that the sound generation system performs as specified in paragraphs G.3.1.1.7 through G.3.1.1.7.7. For Group A tests this test shall be performed through the use of Acceptance Test Procedure 121697 (or equivalent) in order to demonstrate sound cues are present. Sound synchronization and spatial positioning shall be demonstrated via system training exercise (see 6.2). For ~~F~~first ~~A~~article tests vehicle sounds shall be measured at two-thirds throttle in drive mode along a surface simulating a paved, smooth, and level road. Measurements shall be taken at the ear position of each operator or crew position. The sound level meter shall conform to requirements for Type 1, as specified by ~~ANSI~~ANSI S1.4 and shall be calibrated in accordance with the sound level meter manufacturer's instructions. Calibrators shall conform to ~~ANSI~~ANSI S1.40 and shall address the influence of microphones, cables, amplifiers, and recorders.

4.5.17.2 Communication System.

It shall be verified by examination and demonstration that the M2A2/M3A2 module provides the vehicle commander, gunner, driver and three troop compartment crew stations with the radio and intercom capabilities specified in paragraph 3.7.6. Verification of performance and compliance with the requirements shall be accomplished by conducting a training exercise that will allow for communication between crew members (via the use of the intercom select switches), OC, and other desired modules in the simulation.

4.5. 17.3 Visual display system.

The visual display system requirements of paragraph G.3.1.1.1 shall be verified as specified in Table XII.

4.5.17.4 Physical characteristics.

The M2A2/M3A2 simulator module shall be examined to verify that it is provided with a driver, a turret compartment and troop compartment complying with the physical characteristics requirements as specified in paragraph G.3.1.2. Test of all quantitative requirements related to forces, dead bands, deflection, torque, throw and rates for the controls and switches specified in paragraphs G.3.1.2 through G.3.1.2.1.5 shall be performed. Failure to fall within the tolerances specified in the requirements shall constitute failure of the test.

4.5.17.4.1 Control and Indicators.

For Group A tests it shall be demonstrated by the use of Acceptance Test Procedure 121697 that design of controls and indicators are in accordance with the requirements of paragraph G.3.1.2.1. For ~~F~~first ~~A~~article tests a random sample of not more than 50% ~~percent~~ of the controls and indicators of the individual crew stations, specified in paragraphs G.3.1.2.1.1 through G.3.1.2.1.6, ~~will~~ be specified (see 6.2) to verify appropriate location, operability, and realism.

4.5.17.5 External Interface Unit.

It shall be verified by examination and system scenario execution that the M2A2/M3A2 module provides the external interface unit as specified in paragraph G.3.1.2.2.

4.5.18 Dismounted infantry module.

The DI module shall be examined and demonstrated by execution of system scenario to verify that it operates in the CCTT environment and provides the infantry platoon leader, forward observer, and squad leaders with performance capabilities that replicates ~~“real world”~~ interactions as required by CCTT. The DI module shall also be examined and tested to verify the additional requirements as specified in 3.7.10, the common module design requirements of 3.6, the system design requirements of 3.2 through 3.2.3 of this specification, and associated systems as described in the following paragraphs.

4.5.18.1 Physical characteristics.

The DI module shall be examined and tested through the use of Acceptance Test Procedure 121701 (or equivalent) ~~and selected system scenarios as specified in 6.2~~ to verify that it is provided with one platoon leader, one forward observer position, and two squad leader positions that interact among themselves and with other system modules. ~~Randomly selected equipment~~ First article ~~(controls, indicators and other pieces of equipment)~~ shall be examined and tested to verify that this equipment complies with the requirements of paragraphs 3.7.10.1 through 3.7.10.1.2.

4.5.18.2 Performance characteristics.

The requirements of paragraph 3.7.10.2 shall be considered verified by successful completion of the following:

- a. Demonstration that the DI module design has the capability to simulate the weapons as specified in paragraph 3.7.10.2.1. Training exercises shall be conducted to verify the performance and modeling of the specified weapons requirements.
- b. Examination and demonstration that the DI module system has the capability to replicate real world activities of both the platoon and squad in the CCTT environment, and that the additional requirements of paragraph 3.7.10.2.2 have been met. Training collective tasks shall be conducted to verify that the requirements have been met.
- c. Demonstration that the ~~F~~ire ~~C~~ontrol ~~S~~ystem components (3.7.10.2.3) of the module replicates in design and performance the operational equipment. The selected exercises (see 6.2) ~~will~~ shall include both stationary and moving targets that can be hit from stationary and on the move positions.
- d. ~~d.~~ Demonstration by operation of the equipment, the capabilities of management, depletion, and resupply of both ammunition and personnel (3.7.10.2.4) shall be conducted via sytem scenario execution.

4.5.18.3 Control and indicators.

It shall be demonstrated via system scenario execution and for Group A tests via Acceptance Test Procedure 121701 that the design of controls and indicators are in accordance with the requirements of paragraphs 3.7.10.3 through 3.7.10.3.2. For first article tests the controls and indicators of the individual platoon leader position, forward observer position, and squad leader

position, specified in paragraphs 3.7.10.3.1 and 3.7.10.3.2, shall be tested to verify appropriate location, operability, and realism.

4.5.18.4 Visual display system.

The capabilities and characteristics of the visual system (3.7.10.4) shall be verified as specified Table XII.

4.5.18.5 Communication System.

It shall be verified by examination and system scenario execution that the module provides normal communications between the platoon leader, squad leaders, M2A2/M3A2 BFV, and other modules, as well as company headquarters and the Operations Center. The requirement of the radio capabilities (3.7.10.5.1) shall be verified by examination, and the performance shall be verified as in paragraph 4.5.18.5.

4.5.18.6 Sound generation system.

For Group A tests it shall be verified through demonstration by conducting Acceptance Test Procedure 121701 (or equivalent) that the sound generation system performs as specified in paragraphs 3.7.10.6 - 3.7.10.6.7. Sound synchronization and spatial positioning shall be demonstrated via system training exercise (see 6.2). For First Article tests measurements shall be taken at the ear position of each operator or crew position. The sound level meter shall conform to requirements for Type 1, as specified by ANSI S1.4 and shall be calibrated in accordance with the sound level meter manufacturer's instructions. Calibrators shall conform to ANSI S1.40 and shall address the influence of microphones, cables, amplifiers, and recorders.

4.5.19 FIST-V module.

For Group A tests the FIST-V Module provided for the CCTT system shall be examined, demonstrated and tested through the use of Acceptance Test Procedure 121699 (or equivalent). For Group B tests and selected system scenarios as specified in (see 6.2) shall be executed for verification of requirements included in Appendix I, module common performance characteristics of the M981 carrier paragraphs 3.6 through 3.6.7, and the system design requirements of paragraphs 3.2 through 3.2.3 shall be performed. Generation of any priority 1 or 2 PTRs (with exception of documented or latent PTRs within the government furnished software) shall constitute a test failure. Retesting shall be confined to execution of scenarios necessary to verify proper operation of a failed function. Correction of priority 3 through 5 PTRs shall be as specified in the contract (see 6.2). Failure to meet the requirements in Appendix I, paragraphs 3.6 through 3.6.7 and 3.2 through 3.2.3 shall constitute failure of this test.

4.5.19.1 Sound Generation System.

It shall be verified through test that the sound generation system performs as specified in paragraphs I.3.1.1.7 through I.3.1.1.7.7. For Group A tests this test shall be performed through the use of Acceptance Test Procedure 121699 (or equivalent) in order to demonstrate sound cues are present. Sound synchronization and spatial positioning shall be demonstrated via system training exercise (see 6.2). For First Article tests vehicle sounds shall be measured at two-thirds throttle in drive mode along a surface simulating a paved, smooth, and level road. Measurements shall be taken at the ear position of each operator or crew position. The sound

level meter shall conform to requirements for Type 1, as specified by ~~ANSI~~ S1.4 and shall be calibrated in accordance with the sound level meter manufacturer's instructions. Calibrators shall conform to ~~ANSI~~ S1.40 and shall address the influence of microphones, cables, amplifiers, and recorders.

4.5.19.2 Communication system.

It shall be verified by examination and demonstration that the FISTV module provides the commander, observer, communication and driver stations with the radio and intercom capabilities specified in paragraph 3.7.6. Verification of performance and compliance with the requirements shall be accomplished by conducting a training exercise that ~~will~~ shall allow for communication between crew members (via the use of the intercom select switches), OC and other modules in the simulation.

4.5.19.3 Visual Display System.

The visual display requirements of paragraph I.3.1.1.1 shall be verified as specified in Table XII.

4.5.19.4 Physical Characteristics.

The FISTV simulator module shall be examined to verify that it is provided with a driver and a turret compartment complying with the physical characteristic requirements specified in paragraph I.3.1.2. Test of all quantitative requirements related to forces, dead bands, deflection, torque, throw and rates for the controls and switches specified in paragraph I.3.1.2 through I.3.1.2.5 shall be performed. Failure to fall within the tolerances specified in the requirements shall constitute failure of the test.

4.5.19.4.1 Controls and Indicators.

For Group A tests it shall be demonstrated by the use of Acceptance Test Procedure 121699 that design of controls and indicators for the FISTV module is in accordance with the requirements of paragraphs I.3.1.2.1 through F.3.1.2.6. For ~~F~~first ~~A~~article tests a random sample not more than ~~50% percent~~ of controls and indicators of the individual crew stations, specified in paragraphs I.3.1.2.1 through I.3.1.2.6, ~~wi~~shall be selected to verify appropriate location, operability and realism. Presence of one or more defects shall be cause for rejection of the unit.

4.5.19.5 External Interface Unit.

It shall be verified by examination and system scenario execution that the FISTV module provides the external interface unit as specified in paragraph I.3.1.2.7.

4.5.20 M1A2 module.

For Group A tests The M1A2 Module provided for the CCTT system shall be examined, demonstrated and tested through the use of Acceptance Test Procedure 121696 (or equivalent). and For Group B tests selected system scenarios ~~as specified in (see 6.2)~~ shall be executed; for ~~V~~verification of requirements included in Appendix H, module common performance requirement paragraphs 3.6 through 3.6.7 and system design requirements of paragraphs 3.2 through 3.2.1 ~~shall be performed. Failure to meet the requirements in Appendix H, paragraphs 3.6 through 3.6.7 and 3.2 through 3.2.3 shall constitute failure of this test.~~ Generation of any priority 1 or 2 PTRs (with exception of documented or latent PTRs within the government furnished software) shall constitute a test failure. Retesting shall be confined to execution of

scenarios necessary to verify proper operation of a failed function. Correction of priority 3 through 5 PTRs shall be as specified in the contract (see 6.2).

4.5.20.1 Sound Generation System.

It shall be verified through test that the sound generation system performs as specified in paragraphs H.3.1.1.7 through H.3.1.1.7.7. For Group A tests this test shall be performed through the use of Acceptance Test Procedure 121696 (or equivalent) in order to demonstrate sound cues are present. Sound synchronization and spatial positioning shall be demonstrated via system training exercise (see 6.2). For ~~First~~first ~~A~~article tests vehicle sounds shall be measured at two-thirds throttle in drive mode along a surface simulating a paved, smooth, and level road. Measurements shall be taken at the ear position of each operator or crew position. The sound level meter shall conform to requirements for Type 1, as specified by ~~ANSI~~ANSI S1.4 and shall be calibrated in accordance with the sound level meter manufacturer's instructions. Calibrators shall conform to ~~ANSI~~ANSI S1.40 and shall address the influence of microphones, cables, amplifiers, and recorders.

4.5.20.2 Communication system.

It shall be verified by examination and demonstration that the M1A2 module provides the commander, loader, and driver stations with the radio and intercom capabilities specified in paragraph 3.7.6. Verification of performance and compliance with the requirements shall be accomplished by conducting a training exercise that will allow for communication between crew members (via the use of the intercom select switches), OC and other modules in the simulation.

4.5.20.3 Visual display system.

The visual display requirements of paragraph H.3.1.1.1 shall be verified as specified in Table XII.

4.5.20.4 Physical Characteristics.

The M1A2 simulator module shall be examined to verify that it is provided with a driver and turret compartment complying with the physical characteristics requirements specified in paragraph H.3.1.2. Test of all quantitative requirements related to forces, dead bands, deflection, torque, throw, and rates for the controls and switches specified in paragraphs H.3.1.2 through H.3.1.2.2.4 shall be performed. Failure to fall within the tolerances specified in the requirements shall constitute failure of this test.

4.5.20.4.1 Controls and Indicators.

For Group A tests it shall be demonstrated by the use of Acceptance Test Procedure 121696 (or equivalent) that design of controls and indicators for the M1A2 module is in accordance with the requirements of paragraphs H.3.1.2.1 through H.3.1.2.2.6. For ~~F~~f~~irst~~irst ~~A~~article tests a random sample of controls and indicators of not more than 50 ~~percent~~percent of the individual crew stations, as specified in paragraphs H.3.1.2.1 through H.3.1.2.2.6, ~~wi~~shall be selected to verify appropriate location, operability, and realism. Presence of one or more defects shall be cause for rejection of the unit.

4.5.20.5 External Interface Unit.

It shall be verified by examination and system scenario execution that the M1A2 module provides the external interface unit as specified in paragraph H.3.1.2.3.

4.5.21 M113A3 APC Module.

~~For Group A tests~~ ~~The~~ M113A3 APC Module provided for the CCTT system shall be examined, demonstrated and tested through the use of Acceptance Test Procedure 121698 (or equivalent). ~~and For Group B tests~~ selected system scenarios (see 6.2) shall be executed for as specified in 6.2. ~~Verification of requirements included in Appendix E, module common performance requirement paragraphs 3.6 through 3.6.7 and system design requirements of paragraphs 3.2 through 3.2.1 shall be performed. Failure to meet the requirements in Appendix E, paragraphs 3.6 through 3.6.7 and 3.2 through 3.2.3 shall constitute failure of this test. Generation of any priority 1 or 2 PTRs (with exception of documented or latent PTRs within the government furnished software) shall constitute a test failure. Retesting shall be confined to execution of scenarios necessary to verify proper operation of a failed function. Correction of priority 3 through 5 PTRs shall be as specified in the contract (see 6.2).~~

4.5.21.1 Sound Generation System.

It shall be verified through test that the sound generation system performs as specified in paragraphs E.3.1.1.7 through E.3.1.1.7.7. For Group A tests this test shall be performed through the use of Acceptance Test Procedure 121698 (or equivalent) in order to demonstrate sound cues are present. Sound synchronization and spatial positioning shall be demonstrated via system training exercise (see 6.2). For ~~F~~first ~~A~~article tests vehicle sounds shall be measured at two-thirds throttle in drive mode along a surface simulating a paved, smooth, and level road. Measurements shall be taken at the ear position of each operator or crew position. The sound level meter shall conform to requirements for Type 1, as specified by ~~ANSI~~A S1.4 and shall be calibrated in accordance with the sound level meter manufacturer's instructions. Calibrators shall conform to ~~ANSI~~A S1.40 and shall address the influence of microphones, cables, amplifiers, and recorders.

4.5.21.2 Communication System.

It shall be verified by examination and demonstration that the M113A3 APC module provides the commander's and driver stations with the radio and intercom capabilities of paragraph 3.7.6. Verification of performance and compliance with the requirements shall be accomplished by conducting a training exercise that ~~will~~shall allow for communication between crew members (via the use of the intercom select switches), OC, and other desired modules in the simulation.

4.5.21.3 Visual Display System.

The visual display system requirements of paragraph E.3.1.1.1 shall be verified as specified in Table XII.

4.5.21.4 Physical Characteristics.

The M113A3 APC module shall be examined to verify that it is provided with a driver's station and a commander's station complying with the requirements of paragraph E.3.1.2 through E.3.1.2.2. Test of all quantitative requirements related to forces, dead bands, deflection, torque, throw, and rates for the controls and switches specified in paragraphs E.3.1.2 through E.3.1.2.2 shall be performed. Failure to fall within the tolerances specified in the requirements shall constitute failure of this test.

4.5.21.4.1 Controls and Indicators.

For Group A tests it shall be demonstrated by the use of Acceptance Test Procedure 121698 (or equivalent) that design of controls and indicators are in accordance with the requirements of paragraphs E.3.1.2.1 through E.3.1.2.2. E.3.1.2.1 and E.3.1.2.2 to verify appropriate operability, and realism. For ~~F~~A first ~~A~~ article tests a random sample of not more than 50 ~~percent~~% of controls and indicators of the individual crew stations, as specified in paragraphs E.3.1.2.1 through E.3.1.2.2, will be selected to verify appropriate location, operability, and realism. Presence of one or more defects shall be cause for rejection of the unit.

4.5.21.5 External Interface Unit.

It shall be verified by examination and system scenario execution that the M113A3 APC module provides the external interface unit as specified in paragraph E.3.1.2.3.

4.5.22 HMMWV module.

~~For Group A tests T~~he HMMWV Module provided for the CCTT system shall be examined, tested, and demonstrated through the use of Acceptance Test Procedure 121700 (or equivalent). ~~For Group B tests and selected system scenarios (see 6.2) will be executed for as specified in 6.2.~~
~~V~~erification of requirements included in Appendix J, module common performance design requirements of paragraphs 3.6 through 3.6.7, the system design requirements of paragraphs 3.2 through 3.2.1 ~~shall be performed. Failure to meet the requirements of Appendix J, 3.2 through 3.2.1 and 3.6 through 3.6.7 shall constitute failure of this test. Generation of any priority 1 or 2 PTRs (with exception of documented or latent PTRs within the government furnished software) shall constitute a test failure. Retesting shall be confined to execution of scenarios necessary to verify proper operation of a failed function. Correction of priority 3 through 5 PTRs shall be as specified in the contract (see 6.2).~~

4.5.22.1 Sound Generation System.

It shall be verified through test that the sound generation system performs as specified in paragraphs J.3.1.1.7 through J.3.1.1.7.7. For Group A tests this test shall be performed through the use of Acceptance Test Procedure 121700 in order to demonstrate sound cues are present. Sound synchronization and spatial positioning shall be demonstrated via system training exercise (see 6.2). For ~~F~~A first ~~A~~ article tests vehicle sounds shall be measured at two-thirds throttle in drive mode along a surface simulating a paved, smooth, and level road. Measurements shall be taken at the ear position of each operator or crew position. The sound level meter shall conform to requirements for Type 1, as specified by ~~ANSI~~IA S1.4 and shall be calibrated in accordance with the sound level meter manufacturer's instructions. Calibrators shall conform to ~~ANSI~~IA S1.40 and shall address the influence of microphones, cables, amplifiers, and recorders.

4.5.22.2 Communication System.

It shall be verified by examination and demonstration that the HMMWV module provides the driver and forward observer stations with the radio capabilities of paragraph 3.7.6. Verification of performance and compliance with the requirements shall be accomplished by conducting a training exercise that will allow for communication between crew members, OC, and other desired modules in the simulation.

4.5.22.3 Visual display system.

The visual display system requirements of paragraph J.3.1.1.1 shall be verified as specified in Table XII.

4.5.22.4 Physical characteristics.

The HMMWV simulator module shall be examined to verify that it is provided with a consolidated enclosure for the driver and observer positions complying with the physical characteristics requirements of paragraph J.3.1.2. Test of all quantitative requirements related to forces, dead bands, deflection, torque, throw, and rates for the controls and switches specified in paragraphs J.3.1.2 through J.3.1.2.1.3 shall be performed. Failure to fall within the tolerances specified in the requirements shall constitute failure of this test.

4.5.22.4.1 Control and indicators.

For Group A tests it shall be demonstrated by the use of Acceptance Test Procedure 121700 (or equivalent) that design of controls and indicators are in accordance with the requirements of paragraphs J.3.1.2.1 through J.3.1.2.1.3. For First Article tests a random sample of controls and indicators of not more than 50 ~~percent~~% of the individual crew stations, as specified in paragraphs J.3.1.2.1 through J.3.1.2.1.3, ~~shall~~ will be selected to verify appropriate location, operability, and realism. Presence of one or more defects shall be cause for rejection of the unit.

4.5.22.5 External Interface Unit.

It shall be verified by examination and system scenario execution that the HMMWV module provides the external interface unit as specified in paragraph J.3.1.2.2.

4.5.23 System performance

It shall be verified by examination and by execution of system exercise (see 6.2) that the CCTT system implements the system performance techniques and design requirements as specified in paragraphs 3.2 and 3.2.1

4.5.24 System latency

It shall be verified by analysis and test that the CCTT system response latency meets the requirements as specified in paragraphs 3.2.2.1 - 3.2.2.2. Latency tests shall be conducted for 2 test cases: (1) intermodule (between 2 different modules) and (2) intramodule (within a single module). For observable visual and aural cues, intermodule latencies shall be between -150 milliseconds and +350 milliseconds, and intramodule latencies shall not exceed 273 milliseconds. In each case measure shall be taken for latency for sounds, for visual responses with animations (ie gun tube blast animations), and for visual responses without animations. Sufficient measurements shall be taken for each test case to establish a valid average measurement. A dual trace oscilloscope shall be used to collect latency measurements. An example of a valid sound test is measurement of the time from depression of a main gun trigger until a gunblast sound begins. An example of a valid visual latency test with animation is measurement of the time from depression of a main gun trigger until a gun flash animation begins. An example of a valid visual latency test without animation is measurement of the time from activation of a light switch until the light illuminates.

4.5.25 Dead reckoning algorithms (DRAs)

It shall be verified by analysis that DRA methodology requirements specified in paragraph 3.2.3 are met.

4.5.26 Design modularity

It shall be verified by examination that the modular design requirements specified in paragraph 3.2.4 are implemented.

4.5.27 Training system definition

It shall be verified by examination that the training system configuration requirements specified in paragraph 3.1 are met.

4.6 Environmental tests.

The requirements of (3.2.10 - 3.2.10.5) and 3.8.2 – 3.8.2.2 shall be verified as follows:

- a. An analysis and certification verifying that the CCTT hardware design will meet the environmental conditions of 3.2.7 – 3.2.7.5 and 3.8.2 shall be provided. The analysis and certification shall verify that all parts are mounted adequately to prevent loosening, damaging, and disturbing settings and adjustments encountered during handling, transportation, and service environments. The requirements of temperature and relative humidity shall also be verified by the successful completion of the analysis and demonstration of 4.18 of this specification.
- b. For Mobile CCTT equipment.
 - (1) Mobile CCTT equipment shall be tested in accordance with MIL-STD-810, Method 507.3, Procedure II for a minimum of five 24-hr cycles for both operational and non-operational temperatures. At the conclusion of the test, the equipment shall not show any damage nor any degradation of performance.
 - (2) Mobile CCTT equipment shall be tested in accordance with MIL-STD-810, Method 502.3, Procedures I, II, and III. The internal chamber temperature shall be stabilized following the guidance of MIL-STD-810, paragraphs 5.1.3.1 and 5.1.3.2.. After operational temperature stabilization has been attained the system shall be fully operable for a minimum of 4 hours. Non-operational temperature requirement shall be tested for a 24 hour cycle. At the conclusion of the test, the equipment shall not suffer from any damage or degradation of performance.
 - (3) Mobile CCTT equipment shall be tested in accordance with MIL-STD-810, Method 501.3, Procedure I and II. The internal chamber temperature shall be stabilized following the guidance of MIL-STD-810, paragraphs 5.1.3.1 and 5.1.3.2. A minimum of 3 cycles (24 hour period per cycle) shall be conducted for Procedure I and II. At the conclusion of the test, the equipment shall not suffer from any damage or any degradation of performance.
 - (4) After exposure to each environment specified [4.6.b (1, 2, 3,)], the equipment shall be operated to verify compliance with Tables IV, V, and VI of this specification.

4.7 Built-in-test.

The Built-in-test capabilities requirements of paragraphs 3.2.6.2.1 through 3.2.6.2.1.3 shall be demonstrated prior to and during system scenario execution (see 6.2). Daily readiness check shall be demonstrated prior to system exercise. Performance monitoring shall be demonstrated during scenario execution. Fault localization capabilities shall be demonstrated in each system unit (see 6.2).

4.8 Safety test.

The CCTT shall be examined (see Appendix E) in conjunction with the CCTT Safety Assessment Report to verify compliance with the requirements of paragraphs 3.3.3 through 3.3.3.4 of this specification.

4.8.1 Human factors engineering

The CCTT system shall be examined to verify compliance with the requirements of paragraph 3.3.4 of this specification.

4.9 Availability

The CCTT availability requirement as specified in paragraph 3.2.5 shall be demonstrated via system scenario execution (see 6.2). Failures shall be scored by the failure review board (FRB) in accordance with the CCTT Failure Definition and Scoring Criteria (FD/SC) in Appendix B.

4.10 Maintainability demonstration.

A maintainability demonstration shall be conducted in accordance with a ~~modified~~ MIL-STD-471 stratification approach to verify the requirements of paragraph 3.2.6 of this specification. The tasks to be demonstrated shall be selected from an approved list of maintainability demonstration candidate tasks.

4.11 Recycled, recovered, or environmentally preferable materials.

A certificate of compliance shall be provided that verifies that the materials and processes used in CCTT components comply with the requirements of paragraph 3.3.1. Random samples of each component shall be examined to validate the certificate of compliance.

4.11.1 Color.

One representative sample of each individual item listed in paragraph 3.2.4.8 shall be selected and examined for color conformance. The examination shall utilize a procedure conforming to the guidelines in ASTM D-1729, and shall be of the of "general" type. Consensus judgement by three observers, one of whom has been designated by the procuring activity, that the color of a selected item conforms to its specified FED-STD-595 color chip shall be evidence of the item's compliance.

4.12 Mobile CCTT requirements.

The ~~M~~mobile CCTT shall be examined and tested via system scenario execution (see 6.2) to verify that its design provides the required configuration, simulators per trailer, and collocated workstations with the capabilities as specified in paragraphs 3.8 and 3.8.1. Noncompliance with any specified examination or test or presence of one or more defects shall constitute cause for rejection.

4.12.1 Environmental conditions.

The Mobile CCTT environmental conditions of paragraphs 3.8.2 through 3.8.2.2 shall be verified as specified in paragraph 4.6 of this specification.

4.12.1.1 Lightning protection.

The Mobile CCTT configuration shall be certified to comply with the lightning requirements of paragraph 3.8.2.3. The angle of any bend of the down conductors required in paragraph 3.8.2.3 shall not be less than 90 degrees nor ~~shall~~ have a radius of bend less than 8 inches.

4.12.1.2 Shock and Vibration.

Mobile CCTT equipment shall be tested in accordance with MIL-STD-810, method 514.4, Procedure II. For basic transportation; test levels and conditions shall be as specified in I-3.3.1.2 of method 514.4. The test duration shall be based on 2000 miles of expected transportation over improved roads and 500 miles over unimproved roads. At the conclusion of the test, the equipment shall not suffer from any degradation in performance.

4.12.2 Semitrailers.

Each semitrailer shall be certified for compliance with the general requirements as specified in paragraph 3.8.4.

4.12.2.1 Identification marking and data plates.

Each semitrailer shall be inspected and examined to verify the legibility and location of all labels required in paragraphs 3.4 and 3.4.4. Inspection of each trailer shall demonstrate provision for attachment of license plate.

4.12.2.2 Color.

One representative sample of each individual item listed in paragraph 3.8.4.2 shall be selected and examined for color conformance. The examination shall utilize a procedure conforming to the guidelines in ASTM D-1729, and shall be of the of "general" type. Consensus judgement by three observers, one of whom has been designated by the procuring activity, that the color of a selected item conforms to its specified FED-STD-595 color chip shall be evidence of the item's compliance.

4.12.2.3 Corrosion prevention.

A certification regarding the corrosion prevention requirements of paragraph 3.8.4.3 shall be presented to Government representatives for examination and approval.

4.12.2.4 Wood.

A certification regarding the wood requirement of paragraph 3.8.4.4 shall be presented to Government representatives for examination and approval.

4.12.2.5 Wood treatment.

A certification regarding the wood treatment requirements of paragraph 3.8.4.5 shall be presented to Government representatives for examination and approval.

4.12.2.6 Weights, loads, dimensions.

4.12.2.6.1 Net weight.

Each semitrailer without internal CCTT equipment shall be weighed to verify compliance with the net weight requirements of paragraph 3.8.4.6.1.

4.12.2.6.2 Rated payload capacity.

During first article Each semitrailer shall be weighed using a simulated payload of no less than 24,000 pounds evenly distributed through the semitrailer to verify compliance with the rated payload capacity requirements of paragraph 3.8.4.6.2. This simulated payload shall be used for all verifications which require a payload, and any failure of this payload attributable to the semitrailer during the course of the test shall constitute failure of the test being performed.

4.12.2.6.3 Gross weight.

During first article Each semitrailer shall be weighed to verify the gross weight requirements of paragraph 3.8.4.6.3. Measured weight using simulated payload shall not exceed 80,000 pounds. Failure to meet this requirement shall constitute failure of the test.

4.12.2.6.4 Dimensions.

Each semitrailer shall be measured to verify compliance with the external dimensions of paragraph 3.8.4.6.4.1 and the interior dimensions of paragraph 3.8.4.6.4.2.

4.12.2.7 Performance.

Each semitrailer shall be tested to verify compliance with the performance requirements of paragraphs 3.8.4.7 through 3.8.4.7.4. This test shall be performed concurrently with the road test requirement of paragraph 4.12.4, except for the 20 percent on hard terrain requirement. Failure to meet this requirement shall constitute failure of the test.

4.12.2.7.1 Brakes performance.

The semitrailer service brakes shall be tested and certified to comply with the brake performance requirements of paragraph 3.8.4.7.3, 3.8.4.12.1 and 3.8.4.12.2. This test may be combined with the road test requirement of 4.12.4. The brake system shall be examined for completeness to include the presence of automatic slack adjusters, piping, hose connections, gladhands, and spring loaded dust covers or dummy gladhands equipped with retention devices.

4.12.2.7.2 Slope and grade.

The semitrailer shall be tested to verify compliance with the slope and grade requirements of paragraph 3.8.4.7.4. Failure to meet this requirement shall constitute failure of the test.

4.12.2.8 Suspension system.

Each semitrailer shall be examined to verify conformance with the suspension system requirements of paragraph 3.8.4.8. The capabilities of the suspension system shall be demonstrated by means of the semitrailer weight test of paragraph 4.12.2.6, performance test of paragraph 4.12.2.7, and the road test of paragraph 4.12.4. Failure to meet this requirement shall constitute failure of the test.

4.12.2.9 Axles.

Each semitrailer shall be examined and tested to verify conformance with the axles requirements of paragraph 3.8.4.9. The weight test of paragraph 4.12.2.6 shall be used to verify the axles requirements.

4.12.2.10 Wheels, rims, tires, and tubes.

The semitrailer shall be examined and certified to verify compliance with the requirements of paragraphs 3.8.4.10 through 3.8.4.10.2.

4.12.2.11 Rear wheel splash and stone throw protection.

The semitrailer shall be examined and certified to comply with mud flaps and splash and stone throw protection requirements of paragraph 3.8.4.11.

4.12.2.12 Brakes.

The brakes requirements of paragraph 3.8.4.12.1 and 3.8.4.12.2 shall be verify as specified in paragraph 4.12.2.7.1 above.

4.12.2.13 Upper fifth wheel plate.

Each semitrailer shall be examined and certified to verify compliance with the upper fifth wheel requirements of paragraph 3.8.4.13. Ease of coupling requirement shall be tested during 4.12.4.

4.12.2.14 Landing gear and leveling jacks.

Each semitrailer shall be examined to verify conformance with the landing gear and leveling jacks requirements of paragraph 3.8.4.14.. The requirements shall be verified by means of the road test of 4.12.4 and weight test of paragraph 4.12.2.6. In addition, the leveling requirement on any slope of up to 5 degrees (over short dimension of the semitrailer) and 1 degree (over the long dimension of the semitrailer) shall be demonstrated during uncoupling operations. Upon completion of the road test, the semitrailer shall be examined to verify that no foreign matter has entered the mechanism of the landing gear. The semitrailer shall be uncoupled to verify the operation of the landing gear and leveling jack mechanisms. Failure to meet this requirement shall constitute failure of the test.

4.12.2.15 Level indicators.

Each semitrailer shall be examined and tested to verify conformance with the level indicators requirements of paragraph 3.8.4.15. The operation of the bubble level indicators shall be demonstrated by the test of paragraph 4.12.2.14 above. The readout tilts shall be demonstrated to be within the specified tolerances.

4.12.2.16 Lifting and tiedown attachments.

Each semitrailer shall be examined and certified to verify conformance with the tiedown attachments requirements of paragraph 3.8.4.16. A wind resistance analysis shall be performed to verify compliance with the tiedown attachments requirements of paragraph 3.8.4.16.

4.12.2.17 Rear end protection.

The semitrailer shall be examined and certified to verify compliance with the bumper requirements of paragraph 3.8.4.17.

4.12.2.18 Lubrication.

The semitrailer shall be examined and certified to verify compliance with the lubrication requirements of paragraph 3.8.4.18.

4.12.2.19 Body construction.

The semitrailer body shall be examined and tested to verify compliance with the body construction requirements of paragraphs 3.8.4.19 through 3.8.4.19.6. For First Article only, Aan analysis shall be provided to verify that the platform (3.8.4.19.1), roof (3.8.4.19.3), and floors (3.8.4.20.3) can withstand the rated payload and loads as specified.

4.12.2.19.1 Side wall and roof framing.

The side wall and roof framing of the semitrailer shall be examined and certified to verify compliance with the requirements of paragraph 3.8.4.19.2.

4.12.2.19.2 Front end.

The front end of the semitrailer shall be examined and measured to verify compliance with the requirements of paragraph 3.8.4.19.4.

4.12.2.19.3 External ~~doors/~~ doors and rear doors.

The semitrailer shall be examined and tested to verify conformance with the external door requirements of paragraph 3.8.4.19.5 and the rear doors requirements of paragraph 3.8.4.19.5.1. The adequacy of the door's insulation and gaskets shall be verified by means of the environmental tests of paragraph 4.9 and rain test of paragraph 4.12.5.

4.12.2.19.4 Other external doors.

~~The o~~Other external doors of the semitrailer as defined in 3.8.4.19.5.2 shall be examined, certified, and tested to verify the requirements of paragraph 3.8.4.19.5.2. The adequacy of the thermal protection requirements of paragraph 3.8.4.19.6 shall be verified by means of the environmental tests of paragraph 4.9.

4.12.2.20 Interior construction.

The semitrailer shall be examined to verify compliance with the interior construction requirements of paragraphs 3.8.4.20 through 3.8.4.20.4.

4.12.2.21 Semitrailer lighting.

The semitrailer shall be examined, tested, and certified to verify conformance with the lighting requirements of paragraphs 3.8.4.21 through 3.8.4.21.1.4.

4.12.2.21.1 Twelve Volt Direct Current (VDC) system.

The semitrailer shall be examined and tested to verify compliance with the 12 VDC system requirements of paragraph 3.8.4.21.1.1.

4.12.2.21.2 Receptacle 12 VDC.

The semitrailer shall be examined and certified to verify compliance with the requirements of paragraph 3.8.4.21.1.2.

4.12.2.21.3 Interconnected 24VDC system.

The semitrailer shall be examined and tested to verify compliance with the requirements of paragraph 3.8.4.4.21.1.3.

4.12.2.21.4 Receptacle, 24 VDC.

The semitrailer shall be examined and certified to verify that it is provided with a 24 VDC Receptacle system conforming with the requirements of paragraph 3.8.4.21.1.

4.12.2.21.5 Interior lighting.

Each semitrailer shall be examined to verify compliance with the requirements in paragraphs 3.8.4.21.2. A demonstration on the emergency lighting using 12 volt battery power shall be performed by removing all power to the semitrailer; the battery disable switch should be toggled to ensure proper operation.

4.12.2.21.6 Exterior lighting.

Each semitrailer shall be examined to verify compliance with the requirements in paragraphs 3.8.4.21.3. A demonstration on the exterior lighting using the 12 volt battery power and the power of 3.8.4.31 shall be performed; the battery disable switch should be toggled to ensure proper operation.

4.12.2.21.7 Battery charging system.

Each semitrailer shall be examined to verify compliance with the requirements in paragraphs 3.8.4.21.4

4.12.2.22 External platforms, railings, and stairways.

The semitrailer shall be examined to verify conformance with the external platforms, railings, and stairways requirements of paragraph 3.8.4.22. It shall be demonstrated that the platforms, railings, and stairways are easy to set-up, adjust, dismantle, store, and transport by two people. This shall be accomplished by conducting a set-up and tear down demonstration of the vehicle before and after transportation. Verification of protective enclosure requirement for external maintenance doors shall be accomplished during 4.12.5 rain test.

4.12.2.23 Environmental Control System (ECS).

The semitrailer shall be examined and tested to verify conformance with the environmental control system (ECS) requirements of paragraph 3.8.4.23. The capabilities of the ECS shall be verified by means of the environmental tests of paragraph 4.6.

4.12.2.23.1 Cooling units.

The semitrailer shall be examined and tested to verify conformance with the cooling units requirements of paragraph 3.8.4.23.1. The capabilities of the cooling units shall be verified by means of the environmental tests of paragraph 4.6.

4.12.2.23.2 Heating.

The semitrailer shall be examined and tested to verify conformance with the heating requirements of paragraph 3.8.4.23.2. The capabilities of the heating system shall be verified by means of the environmental tests of paragraph 4.6.

4.12.2.23.3 Control Circuits.

The semitrailer shall be examined to verify conformance with the controls circuits requirements of paragraph 3.8.4.23.3. Responsiveness of the control system to maintain the thermostat set point (paragraph 3.8.4.23.3) after induced control set temperature changes shall be tested for both heating and cooling capabilities of the ECS. At least 5 samples shall be measured at 5 feet above the semitrailer floor; two of the samples shall be taken at the farthest distance from ECS location on the trailer.

4.12.2.23.4 Air Filters.

The semitrailer shall be examined to verify accessible location of the filters and certified for with conformance with the air filters requirements of paragraph 3.8.4.23.4.

4.12.2.23.5 Maintainability.

A maintenance demonstration shall be conducted to verify that the ECS equipment is maintainable (3.8.4.23.5) without removing it from the semitrailer.

4.12.2.24 Humidity control.

The semitrailer shall be examined and tested to verify the humidity control requirements of paragraph 3.8.4.24. The performance of the humidity control device shall be verified by means of the environmental tests of paragraph 4.6.

4.12.2.25 Fire extinguishers.

The semitrailer shall be examined to verify that it is furnished with fire extinguishers located as specified in paragraph 3.8.4.25. Performance shall be verified by means of the safety tests.

4.12.2.26 Alarm system.

The semitrailer shall be examined and tested to verify the security alarm and fire detection system requirements of paragraph 3.8.4.26-3.8.4.26.2.3 Performance of the security alarm and fire detection system shall be verified by means of the safety tests.

4.12.2.27 Telephone system.

The semitrailer shall be examined and tested to verify that the telephone system requirements of paragraph 3.8.4.27 have been met.

4.12.2.28 Furniture and chairs.

The semitrailer shall be examined, certified, and tested to verify the requirements of paragraph 3.8.4.28.

4.12.2.29 Provisions for maintenance work space.

The semitrailer shall be examined and measures taken to verify the provisions for maintenance work space as required by paragraph 3.8.4.29.

4.12.2.30 Provisions for storage of support equipment and materials.

The semitrailer shall be examined and tested to verify that the provisions for storage of support equipment and materials of paragraph 3.8.4.30 have been met. The road test of paragraph 4.12.4 shall be used to verify the adequacy of the means provided to secure items during transport; i.e., furniture, chairs, cables, and other non-mounted trainer equipment.

4.12.2.31 Electrical system.

The semitrailer shall be examined, certified, and tested to verify requirements of paragraphs 3.8.4.31 through 3.8.4.32. The external utility assemblies of 3.8.4.31.2 shall be examined after conclusion of the environmental tests of paragraph 4.6 and the rain test of paragraph 4.12.5. Any evidence of water penetration into these assemblies shall constitute failure of the electrical system.

4.12.2.32 External panels and cables.

The semitrailer shall be examined, tested, and certified to verify compliance with the requirements of paragraph 3.8.4.32. The cables, panels, cable and panel connectors, cable jackets and connector connections shall be examined after conclusion of the environmental tests of paragraph 4.6 and the rain test of paragraph 4.12.5. Any evidence of cracking, deterioration or water penetration shall constitute failure of the external panels and cables.

4.12.2.33 Usable life of trailer.

The semitrailer shall be certified for compliance with the requirements of paragraph 3.8.4.33

4.12.3 Portable Power System (PPS).

The PPS shall be examined, certified, and tested to verify compliance with the requirements of paragraphs 3.8.5 through 3.8.5.3.

4.12.4 Road test.

The road test shall consist of coupling the semitrailer loaded with rated payload to a truck-tractor. The tractor-semitrailer combination shall be driven a distance of not less than 50 miles and shall include turns up to 90 degrees right and left. At least 20 percent of the distance shall be over hard uneven terrain. At least five sudden stops shall be made from a speed of not less than 20 mph. Tracking and turning ability shall be observed to verify conformance with paragraph 3.8.4.7.1 and 3.8.4.7.2. Any evidence of misalignment, binding, leaking, or other malfunction shall constitute failure of the semitrailer.

4.12.5 Rain test.

The mobile CCTT shall be tested IAW the rain test of MIL-STD-810, Method 506.2, Procedure III for both operational and transit/storage configurations.. The watertightness test fixture shall be placed no less than 19 inches (48 cm) from the semitrailer surface. Water sprayed against the semitrailer shall have a pressure of no less than 40 psi. The orientation of the test fixture in reference to the semitrailer shall depend on the location of the doors or compartments. Each door or compartment shall be tested for a 40 minute duration.. Any evidence of water penetration into the test item enclosure following the rain test shall be considered a failure.

4.13 Weight.

An analysis shall be performed to verify the weight requirements of paragraph 3.2.4.1.

4.14 Ceiling height.

The ceiling height requirements of paragraph 3.2.4.2 shall be verified by measurement.

4.15 Equipment access.

The equipment access requirements of paragraph 3.2.4.3 shall be verified by measurement.

4.16 Trainer maintenance access.

The trainer maintenance access requirements of paragraph 3.2.4.4 shall be verified by measurement.

4.17 Power requirements.

An analysis and test shall be performed to document that the CCTT (fixed and mobile) can operate without degradation on the power requirements of paragraphs 3.2.4.5 through 3.2.4.5.4 and 3.8.5 through 3.8.5.3 of this specification. The analysis shall show that major CCTT electrical components can operate without degradation over the required voltage and frequency variation. The test shall consist of input power and voltage and frequency variation.

4.18 Equipment cooling.

An analysis (air-conditioning cooling load) and test shall be performed to verify that the requirements of paragraph 3.2.4.6 have been met. The test shall be performed during actual operation of the CCTT modules at full capacity with full personnel loading and verifying that the conditions inside the modules do not exceed 80 degrees Fahrenheit. This test shall be performed in conjunction with any test in which full system performance is been conducted.

4.19 Lighting.

The lighting requirements of paragraph 3.2.4.7 shall be verified by examination and test.

4.20 Cabling.

The cable installation requirements specified in paragraph 3.2.4.9 shall be verified by examination. Group A inspections shall consist of individual module and workstation examinations. Group B inspections shall consist of facility cabling examinations.

4.21 Transportability

The CCTT equipment shall be visually examined and measured to verify conformance with the transportability requirements of paragraph 3.2.7.5. This requirement shall also be verified by means of analysis